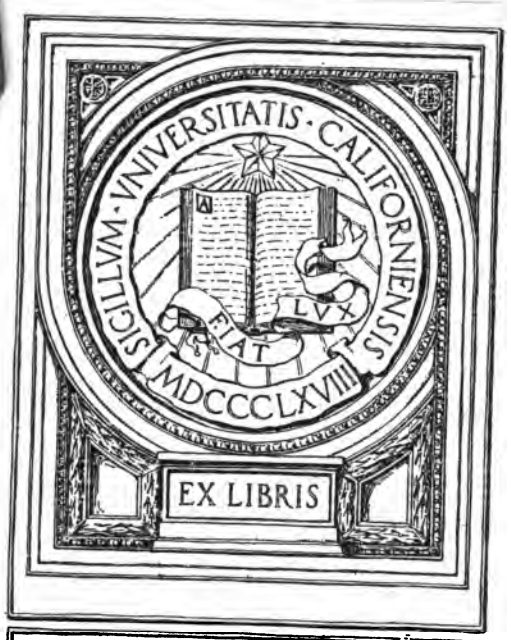
WEALTH OF THE WORLD'S WASTE PLACES AND OCEANIA

J. C. GILSON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WEALTH OF THE WORLD'S WASTE PLACES

AND

OCEANIA

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The great Rainbow natural bridge of southern Utah

REDWAY'S GEOGRAPHICAL READERS

WEALTH OF THE WORLD'S WASTE PLACES

AND

OCEANIA

BY

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ILLUSTRATED

CHARLES SCRIBNER'S SONS

NEW YORK CHICAGO BOSTON

A

PREFACE

ALTHOUGH the term "Waste Places" carries an implied meaning of "worthless," yet, interpreted in the light of Nature's methods, each region described, useless as it may apparently seem, possesses a definite relation to the rest of the world, and therefore to the well-being of man. The Sahara is the track of the winds whose moisture fertilizes the flood-plains of the Nile. The Himalaya Mountains condense the rain that gives life to India. From the inhospitable polar regions come the winds and currents that temper the heat of the tropics.

Nature has secreted many of her most useful treasures in most forbidding places. The nitrates which fertilize so much of Europe are drawn from the fiercest of South American deserts, and the gold which measures American commerce is mined in the arctic wilds of Alaska or in the almost inaccessible scarps of the western highlands. The description of these regions and the portrayal of their relation to the rest of the world is the purpose of Part I of this book.

Part II of the book deals with Oceania—more especially with our island possessions in the Pacific Ocean. It pre-

sents the salient features of the ocean grand division in the light of most recent knowledge.

The author wishes to give credit to Mr. Jacques W. Redway, F.R.G.S., for suggesting the subject of Part I and for the inspiration he received from the distinguished geographer in developing the subject.

J. C. G.

OAKLAND, CALIFORNIA,
December 25, 1912.

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PART I

WEALTH OF THE WORLD'S WASTE PLACES

INTRODUCTION

THERE is a great wealth of literature about what we call the world's productive lands—that is, the densely peopled lands that yield grain, meat, sugar, fruit, and all the various foodstuffs. In any well-equipped library we may find great numbers of useful books that will tell us all about the places where cotton, wool, and silk are grown, or where coal and iron are mined. All these lands are the dwelling places of many people. Networks of railways connect the various cities and villages, and probably a majority of the people living in them have travelled in and about much of the area of these lands.

A large part of the earth's surface is commonly called "unproductive." As a rule this is only another way of saying that such parts of the world produce little foodstuffs. We must not take the word "unproductive" either too literally or too seriously, however, for Dame Nature has a way of secreting some of her choice treasures in places so forbidding and so desolate that only the most resolute and daring men even search for them. For instance, the mineral once much used by the makers of carbonated or "soda" water comes from a part of Greenland that is so bleak, cold, and inhospitable that no human beings can long exist there unless food and fuel are brought them from afar off. The famous "nitrates" of Chile are obtained

in the fiercest part of the Andean desert. Not only the food but the water consumed must be carried to the miners, who are but little better than slaves. Most of the gold and silver is obtained in regions that are unfit for human habitation. The largest diamond fields in the world are in a region that will not produce even grass without irrigation—a region that would not be inhabited were there no diamonds. From the most inhospitable highlands of Asia comes a very considerable part of the precious mineral, jade. Death Valley, in the southern part of the United States, on account of its terrific heat, is perhaps the most unhabitable region in the world, but the borax which it produces is used in every civilized country. And so we might name regions by the score that are practically unhabitable, which nevertheless produce things necessary to civilized man.

We call them "waste places," but this is far from true. For the greater part they are quite as necessary as the places we call fertile. Of foodstuffs, for instance, the greater part of the Rocky Mountain highland produces not much more than the State of New York. Yet the presence of this great mountain wall diverts the moist warm air from the Gulf of Mexico northward, making the Mississippi basin one of the foremost granaries of the world. The absence of rain in the west slope of the Peruvian Andes makes much of the western part of Chile and Peru a desert. But that same absence of rain makes the nitrate beds possible; for had there been yearly rains, the nitrates long since would have been leached out. So, the lands the nitrates now fertilize are far greater in area than that of the region of the nitrates.

Then, perhaps, we turn our eyes oceanward. What! wealth in these great wastes? Most certainly, and indispensable wealth at that. Let us forget for a moment that

the oceans produce about as much meatstuffs as the land; this is really the least important feature about them. The oceans produce one thing that is absolutely necessary for every living thing almost every hour of the day, and that is fresh water. Every drop of fresh water that falls on the land is born of the ocean. Even the cold, polar oceans are indispensable to life, for their waters are constantly flowing out into the warmer oceans, thereby tempering the water of the latter and preventing it from being too warm for living things.

Thus we see that, after all, Dame Nature is not very unkind to her subjects. Compensation is her great law; if her supplies are "short" in one direction they are "long" in another. And when we take the broader view we must conclude that there are no waste places. It is only when we take the extreme and narrow view that we voice the persiflage of the poet Pope:

> "While man exclaims: 'See all things for my use'—
> 'See man for mine,' replies a pampered goose."

Now, these waste places are of various kinds and in pretty nearly every locality. Some are deserts pure and simple; some are very dry and, to avoid hurting our national feelings, we politely refer to them as "arid regions"; some are so rugged and inaccessible that nothing short of dirigible balloons and aeroplanes could open a general communication with them; still others are in polar regions and too bleak and desolate to produce foodstuffs or support human life. The purpose of these chapters is to present the characteristics of these waste places. Most of them have been conquered by man, and their resources have been opened wide to the world. Possibly others yet remain to be conquered, but "what man has done, man can do."

CHAPTER I

THE WEALTH OF THE ARID SOUTHWEST

YEARS ago the maps of the United States depicted a vast region west of the Missouri River stippled with dots, which were supposed to imitate sand, and marked with the portentous legend, "Great American Desert." As sturdy pioneers pushed their settlements farther and farther westward, the great American desert began to shrink in size until the roseate descriptions of prospectors and land speculators led one to believe that this whole region needed only a touch of the plough and the harrow to produce the most bountiful crops grown anywhere in the world.

Nevertheless, the great domain extending from the twenty-five-hundred-foot level to the crest of the Sierra Nevada Mountains is a region so deficient in rainfall that, for the greater part, ordinary foodstuffs will not grow without irrigation; so farming must be confined mainly to the flood-plains of the rivers. Here and there considerable areas have been made fertile by capturing rivers, damming their streams so as to create great reservoirs, and then measuring out the waters to the farm lands below. The Salt River dam in Arizona, recently completed, will supply water to two thousand square miles, or about twenty-five thousand fifty-acre farms.

But in spite of all that man has done and can do to

make this region fruitful, not far from half a million square miles will ever remain barren so far as the production of foodstuffs is concerned. Now this whole region, irrigated lands included, does not produce more wealth than the State of New York alone—possibly it does not produce so much.

Indirectly, however, it is worth more than two thousand million dollars yearly to the rest of the United States; for it is a great highland whose rims, the Sierra Nevada and the Rocky Mountain ranges, are about two miles high. Now, these lofty ranges wring almost every drop of moisture from the rain-bearing winds of the Pacific Ocean, leaving them too dry to shed any moisture over the eastern half of the United States. Because of this great mountain barrier, the winds that bring rain and bountiful crops to the Mississippi Valley and the Atlantic slope, follow an easier passage, flowing directly from the Gulf of Mexico and the Caribbean Sea. And the copious rains are the chief wealth of this midland region.

But the arid western highland possesses a great wealth of its own—a wealth whose influence is world-wide, for it is one of the world's chief storehouses of gold, silver, and copper. Gold and silver are the mediums of commercial transactions, and copper is the chief medium for the transmission of electric power. These metals, therefore, are quite as necessary as are iron and steel. Moreover, this great waste, a seeming incubus on the face of the earth, is each year disclosing more and more of its mineral and agricultural wealth.

Gold is the most widely disseminated of all metals, and is said to be where you find it. That this statement is true has been demonstrated many times, especially during the last few decades. In the north it has been found in the frozen ground of Alaska and Siberia, in the south in

the sands on the surf-beaten shores of Tierra del Fuego and in the reefs of the Transvaal, while it is found in numerous places lying between these extremes.

The vast tract of land in the western part of the United States whence most of these metals are obtained has been

Mohave Desert, California. Buzzards' Roost

the scene of many tragedies. It is an inhospitable region, scanty in both animal and vegetable life, where climatic conditions call for heroic daring on the part of those who would search out its hidden mysteries; it is a land of death-dealing mirages, yet containing untold wealth for the miner, and likewise for the husbandman who can irrigate the fallow parched surface.

The bold prospector has unearthed in many places of southern Nevada gold-bearing rock assaying thousands of

dollars to the ton, the result being the building up of cities and towns and the construction of connecting railroads to meet the demands of the growing commerce. Until recently, silver was the principal metal sought and found in the State of Nevada; but now gold is king, and his throne has been shifted from one desert camp to another, each laying claim to his abundant presence, while new claimants are ever bringing new treasures into light.

The two most valuable deposits of the precious metals now known in Nevada are at Tonopah and Goldfield, the discovery of the first having been made in 1901 and of the latter in the following year. Some of the Goldfield ore has assayed as high as thirty thousand dollars per ton, and so rich were many of its ores that they were sacked and carefully guarded until landed at the reduction works. In one year and a half from the discovery of gold at Goldfield the output reached four million dollars.

These mines of the Nevada deserts excel in the richness and abundance of their ores, while in the future these camps bid fair to outrival in development all other sections of the United States. A few years ago the southern part of the Silver State was considered utterly worthless and a region to be shunned like a charnel-house, on account of its barren and dangerous character. Now it is the Mecca of the gold-seeker.

These mines have already made many a poor man wealthy and many a wealthy man a millionaire. Each hillock, ledge, or ravine holds a possible fortune, and no hardship and peril is too great for the prospector lured by the hope of a rich find. The prosperous desert mining town, first built of canvas and rough lumber, is soon replaced by a better class of buildings, and water is brought through long miles of pipe from the nearest available source. Anon, electric-lighting and other modern conveniences are added,

thereby making life more tolerable in a fierce climate of heat and cold, of fiercer winds and blinding dust.

Not only is gold found in these desert wastes, but borax, nitre, sulphur, silver, salt, soda, opals, garnets, turquoises, onyx, and marble form a part of its resources. Rich gold mines have built the towns of Randsburg and Johannesburg in the midst of the Mohave desert, while finds of rich ore made elsewhere are of frequent occurrence. It is thought that in the near future sufficient nitre can be obtained from the deserts of California and Nevada to render the United States independent of Chile, from whose desert, Atacama, the world's chief supply of this mineral is now obtained.

Perhaps there is no part of the United States more healthy and at the same time more deadly than the southeastern part of California, embraced in those indefinite areas called the Mohave and Colorado deserts. That life and death should lay claim to the same regions with equal strength seems somewhat of a riddle, but a careful investigation of the conditions will make good the claims of both. Here are regions rivalling the Sahara in heat, lack of water, and barrenness, and in many parts as difficult to traverse; regions full of surprises in deceptive mirages, peculiar vegetation, strange animal life, occasional cloudbursts, purity and exhilarating effects of atmosphere, charm of ever-changing colors reflected from the mountains, wealth of floral display in early spring, and marvellous fertility of soil when touched by the magic wand of water. All these and a certain weirdness of beauty difficult to define give these great wastes a peculiar attraction of their own which only those who have spent much time there can understand and appreciate.

For the dread white plague in its early stages there is no medicine and no other climate that can equal the pure,

healing atmosphere of these deserts. A new lease of life may be gained by the nerve-racked man or woman who will lay aside all home worries and spend a few months at some congenial home on one or another of these deserts.

Gila monsters

Among the animal life found on the desert are the wild-cat, coyote, rabbit, deer, rat, tortoise, scorpion, centipede, tarantula, Gila monster, chuck-walla, desert rattlesnake, sidewinder, humming-bird, eagle, quail, and road-runner. Wild horses and wild donkeys, or "burros," frequent these

great wastes, cropping the vegetation that grows on the oases.

One of the most interesting of these animals is the desert-rat, whose habits, seemingly intelligent and equally curious, enable him to maintain a home amid surroundings most unfavorable to his survival. He is a big, active fellow of a glossy gray color, and since he always leaves something in place of whatever he may carry off, he is often called the trade rat. Night-time is his "busy day."

The house that he builds for himself is a veritable fortified castle built in up-to-date desert-rat style, under a protecting bush or rock, or beside a cactus—preferably a prickly pear. This stronghold, from four to five feet long and three feet high, is made of sticks interwoven with pieces of prickly cactus, thorny twigs, and odd bits in general—great care being taken to have most of the thorns project outward. His private quarters consist of a shallow hole burrowed under the centre of this thorn-woven pile. Access to the interior is gained by a winding passage.

The only enemy that might try to thread the mazy hallway is the rattler, who by an ingenious device is deterred from even making the attempt. To keep his snakeship from intruding on domestic privacy Mr. Rat takes several strips of spiny cactus and lays them flatways across the passageway leading to his retreat.

It is well known that a rattlesnake will not crawl over a prickly substance; hence a traveller when camping out at night in rattlesnake regions often surrounds his sleeping place with a horsehair rope as a safeguard against such an unwelcome intruder. Even the hungry, prowling coyote, who would make short work of the rat could he but get at him, fights shy of lacerating his paws by attempting to tear down the formidable pile.

The desert-rat has a morbid desire to carry to his home

any small article which he may chance to find lying around, as many a desert miner has found to his discomfiture, but he always leaves something in its place, such as a strip of cactus or a stick.

For downright strategy no creature inhabiting the desert surpasses the road-runner, sometimes called the ground-cuckoo or snake-killer. Though omnivorous, this bird lives chiefly on reptiles and mollusks. It is decked in a gay plumage of coppery green, with streaks of white on the sides and a topknot of deep blue. In fleetness of foot it is said to equal the horse. Many stories are told of its surrounding a coiled sleeping rattlesnake with strips of cactus and then tantalizing its victim until, baffled in every attempt to get away, the snake finally inflicts a deadly bite on itself. Then the road-runner leisurely proceeds to devour the suicide.

The characteristic plants of these deserts are sage, mesquite, greasewood, and a great variety of cacti. Of the cactus family, the most conspicuous is the *saguaro*, or giant cactus, which frequently attains the height of fifty feet. All the cacti are leafless and abundantly supplied with sharp, needle-like spines which protect them from herbivorous animals. The bark or outer covering has a firm, close texture that prevents the sap from evaporating during the long, dry season. In traversing the deserts during May and June, one is amazed at the display of beautiful blossoms of white, yellow, purple, pink, and scarlet issuing from their thorny stalks.

The plant most welcome to the thirsty traveller, and which has saved the lives of many a wandering prospector, is the "well of the desert," a barrel-shaped cactus thickly studded with sharp spines. When one cuts out the centre of the plant in a bowl-like form, the cavity soon fills up with a watery liquid that is most refreshing.

Hot and forbidding as are these terrible wastes, they are the dwelling places of several tribes of Indians. The desert cactus furnishes them a large part of their food, and

A giant cactus in Arizona

the fibre is woven into cloth to provide them with clothing. These Indians have been acclimated to the desert for centuries and are well versed in all of its moods and mysteries. They know of no better abode; neither can they be induced to leave it for a more congenial climate and fertile soil. Travellers and prospectors have told many stories

about their experiences in these deserts. But perhaps no story has possessed a greater fascination than that of the lost Pegleg Mine.

The story of this lost mine has been told and retold with many variations for the past seventy years, and more than a score of persons have lost their lives in attempting to rediscover it. In 1836, according to the traditional story, a man named Smith, distinguished from the rest of the Smith family by the possession of a wooden leg, was journeying with several companions from Yuma over the Colorado desert. On account of his wooden stump he was dubbed "Pegleg" by his fellow-travellers.

After having been out several days and not finding any springs or water holes, the prospectors became greatly alarmed and hastened toward three small buttes which they saw standing out in the desert, in the hope of finding water in the dry wash leading from their bases. On arriving at the foot of the hills they were sadly disappointed; diligent search revealed no signs of water. He of the wooden leg climbed to the top of one of the buttes to get a better view of the country, and to the northward saw a high mountain; but before descending, he observed some black stones under his feet and on picking one up found it heavy and filled with a brassy-colored metal. He then picked up several of the stones and put them into his pockets, but being desirous of reaching water as soon as possible, he gave little thought to his find.

He told his companions of the mountain seen to the north and advised all possible haste to reach it, saying that he believed that they would there find water. The next day at nightfall they succeeded in reaching the base of the mountain in an exhausted condition and found a spring of cool, clear water. They were thus barely saved from a lingering death by thirst. The mountain was named Smith Mountain.

At San Bernardino, Smith showed his ore to an expert, who pronounced it nearly pure gold. The real importance of the discovery did not seem to dawn on the one-legged man, however, until thirteen years afterward; then, in 1849, it was heralded to the world that wonderful discoveries of gold had been made in several parts of California and that a man could dig out of the ground a fortune in a few days or weeks. Smith became enthusiastic and organized an expedition in San Francisco to seek for his desert mine where gold could be had for the picking up.

The expedition started out from Los Angeles. One night, just before reaching Smith Mountain, the Indians who had been taken along to pack the supplies secretly decamped with the provisions, thus compelling the prospectors to return as speedily as possible to save their lives. Smith felt discouraged and left the company at San Bernardino. Whether he perished in again trying to find his mine or left the country is not known. At any rate, he was never heard of afterward.

In 1860 a man named McGuire deposited in one of the San Francisco banks several thousand dollars in gold nuggets which he said he obtained near Smith Mountain. He organized a party of six to hunt for the Pegleg Mine. What they found, however, will never be known, for they all perished, and their bleached bones were found on the desert a long time afterward. They were not alone in disaster, however, for very many others in trying to find the legacy of Smith have met the same fate.

But the hidden wealth of this great region, so long known as the "Great American Desert," is by no means confined to its storehouses of gold, silver, and copper. Here, there, and almost everywhere are areas that lack but one element to make them the most productive regions of the world, and that one element is water.

The conquest of the Colorado desert is not the first instance of desert land reclamation in the United States, but it is certainly one of the marvels of the world's history. A more pronounced and inhospitable desert never existed; and, in proportion to the area reclaimed, it is doubtful if one can find greater productivity than the lands that constitute Imperial Valley. Let us take a glance at nature's work in this region.

Long before the Mississippi was born the Colorado was an ancient river and it formerly flowed through a fertile valley. During countless ages it has stripped from the plateau and carried into the Gulf of California a deposit of rock waste from the land surface of its basin many feet deep, and abraded billions of tons of material from its channel. All this silt and detritus have served to fill up the northern part of the gulf, the result of the deposit being an immense land area. At length a great bar was formed across the northern part of the gulf, making a sort of inland sea. Then the hot climate caused the water to evaporate, while from time to time the Colorado overflowed its banks, spreading a rich sediment over the former sea-bed.

Various parts of this depression, which, like Palestine, lie below the sea-level, are known as Salton, Coahuilla, and Imperial Valleys. The lowest part, now filled with water, is usually called the Salton Sea. The whole of this region is comprehended under the name of Colorado Desert. In 1900 a company was formed to reclaim that part of the desert included in Imperial Valley, by taking water out of the Colorado River a few miles below the boundary between California and Mexico.

A main canal, called the Imperial Canal, one hundred miles long, seventy feet wide, and eight feet deep carries water from the Colorado to Imperial Valley, where it is distributed by hundreds of smaller canals. The irrigation

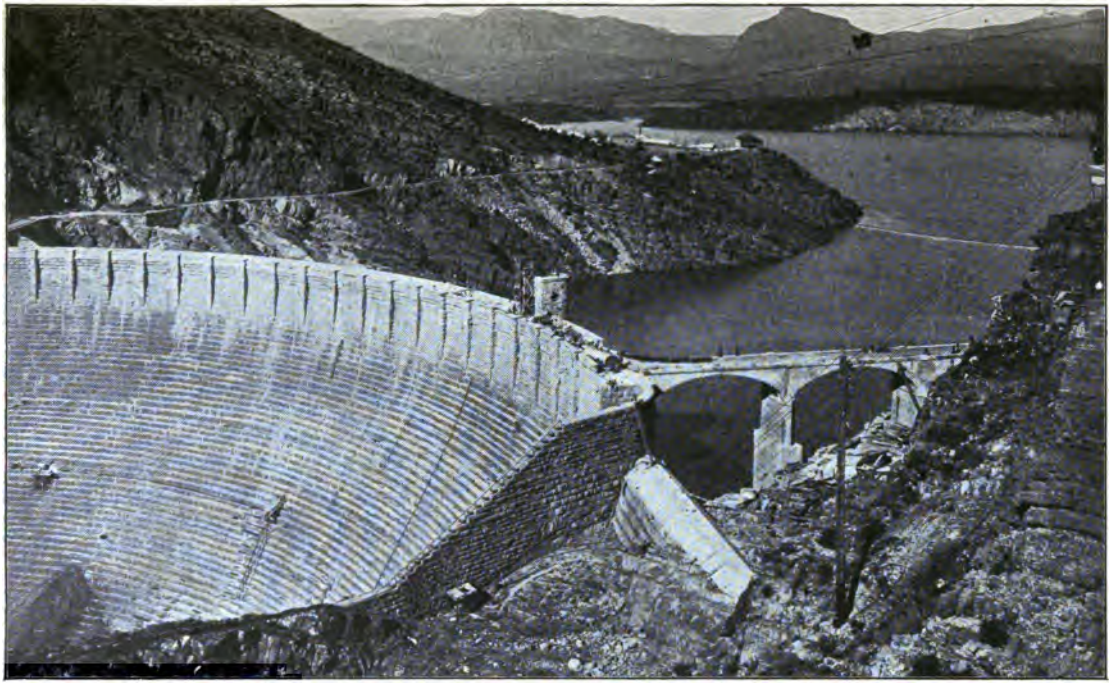
facilities are already sufficient to water more than one hundred thousand acres.

This region, rightly named the hot-house of America, produces marvellous crops of hay, grain, and fruits; it is an ideal place for raising live-stock and poultry as well. Some of this land already brings into its owners from three hundred dollars to seven hundred dollars yearly income per acre, and because of its wonderful fertility it is likened to the valley of the Nile.

In 1904 the Imperial Canal was filled with silt for some distance, thus preventing the flow of the proper amount of water needed for irrigation. To remedy the defect a temporary canal was cut around the head-gate. This expedient had been tried and then the gap had been closed up before high water. At this particular time high water came earlier than usual, and a great flood tore out the channel of the temporary canal to such an extent that before it could be prevented the whole Colorado River was flowing through the breach, leaving its own bed perfectly dry to the Gulf of California, filling up the Salton Valley, burying up the Salton salt-works, and making an inland sea such as formerly existed there. After most strenuous efforts, and at the enormous expense of upward of a million dollars, the gap was at length repaired and the Colorado made to flow in its own bed.

One should remember that in the development of these deserts the prospector owes a deep debt of gratitude to that patient, faithful little beast, the donkey, or "burro," as it is commonly known; without the service of this animal many a man would have suffered a lingering death. As a matter of fact, it is unsafe to venture far out into the desert unaccompanied by this oft-maligned creature—about the only animal fitted to carry supplies.

But the use of dams and canals to conserve and supply



Built by the U. S. Reclamation Service

The Roosevelt Dam, Arizona, showing south bridge and spillwav

water for irrigation prevailed even in most ancient times. Extensive irrigation works were built in Egypt three thousands year ago, and in India, China, Persia, and the countries bordering on the Euphrates and Tigris Rivers irrigation dates back centuries before the Christian era.

The Romans introduced irrigation into southern Europe. When Pizarro conquered the empire of the Incas he found the people possessed of wonderful systems for irrigation. Likewise, Cortez found the Aztecs making extensive canals. Remains of great irrigation works are found to-day in Arizona and New Mexico, where our modern engineers wisely adopt the canal routes which were established by a race now extinct.

At the present time India is irrigating twenty-five million acres of land, the United States thirteen million, Egypt seven million, and Italy three million. It is estimated that the United States has left one hundred and eighty million acres of arid and semi-arid land available for reclamation and four times as much that is incapable of being reclaimed.

No other question of to-day is of such vital and far-reaching importance as that of the reclamation of the millions of acres of sleeping arid lands in the western part of our country. Mines may be exhausted, forests slain, and cities annihilated, but wastes made fruitful through the potency of water will remain everlasting sources of wealth to the nation.

During the last few years our government has been very active in promoting irrigation by building impounding dams and constructing canals and tunnels for the delivery of water. In connection with the various irrigation works the government has already established five hydro-electric plants which furnish water, motive power, and light as may be required. From the big Roosevelt Dam and the drops of the level in the canal connected therewith, twenty-

six thousand horse-power will be developed incidental to the reclamation of two hundred thousand acres of land.

The miracle-working agent, water, has already reclaimed thirteen million acres of our domain, and these areas now produce two hundred and sixty million dollars annually; moreover, they furnish homes to more than three hundred thousand people. Prosperous rural communities with thousands of happy, rosy-cheeked children, blooming orchards, broad, fertile fields prolific beyond comparison, and flourishing cities replace wastes of sand and sage-brush.

The United States Government alone has spent already sixty millions of dollars under the Reclamation Act which went into effect in 1902, and the end is not yet, for as the vista of human achievements in this line broadens still greater works will be inaugurated and successfully consummated. In Arizona, California, Colorado, South Dakota, Montana, New Mexico, Oregon, Utah, Washington, and Wyoming the United States Government already is working on or has completed twenty-six important irrigation projects.

The most wonderful work combining the highest engineering skill and daring is found in the western part of Colorado, where from Black Canyon, an almost inaccessible gorge three thousand feet deep, the whole Gunnison River has been diverted to the Uncompahgre Valley. To take the water out of the river it was necessary to bore a tunnel six miles long through a mountain from the canyon to the valley.

To determine the feasibility of diverting the course of the river, it was first necessary to make an exploration of the canyon. No one before had ever had the hardihood to even make the attempt, on account of the extreme danger of a journey between the narrow black walls of this gloomy abyss.

In 1853 Captain Gunnison discovered the river which bears his name. He traced its course to where it plunged into a chasm so deep and dangerous that he feared to follow it farther and named the gorge Black Canyon. Some twenty years later Professor Hayden of the United States Geological Survey, looking over the brink of the abyss, declared it inaccessible.

The State of Colorado, desiring to find some way of utilizing the waters of the Gunnison River for irrigating the arid land adjacent, in 1900 called for volunteers to explore the canyon. Five men responded.

Provided with boats, life-lines, and other accessories, the men started from Cimarron on their perilous trip. On the third day their provisions gave out, and later they were obliged to abandon their boats and nearly everything else except their blankets, which were protected in rubber bags. They knew it was impossible to retrace their steps and that their only salvation lay in going on. At night they rolled themselves up in their blankets and tried to encourage one another. They travelled fourteen miles between granite walls from two thousand to three thousand feet high; and for sixteen days they were almost without food. Then they came to a cleft in their prison walls which seemed to offer a means of escape.

At their feet the water plunged over a precipice down to an unknown depth. To go on meant almost instant death. They were dying of starvation. Should they go on? They had not accomplished their task. Life was sweet and there were loved ones dependent upon them for support.

So they decided to attempt escape while they had strength. Wearily they climbed the steep and rugged path that led them to freedom. Starting early in the morning, they reached the summit, two thousand five hundred feet above the raging torrent, at nine o'clock at night. They were ready to

drop in their tracks, yet hope inspired them to renewed exertions. They struggled on fifteen miles more ere they staggered into a farm-house on the verge of collapse.

In the following year, 1901, the United States Government, becoming interested in diverting the waters of the Gunnison, sent out one of its engineers, Professor Fellows, to look into the practicability of the project. After looking over the field, the government engineer succeeded in enlisting in his service Mr. Torrence, who was a member of the first expedition. They planned to accomplish the feat which the former explorers failed to accomplish, namely, to go entirely through Black Canyon.

Profiting by the previous trip, they provided for themselves a complete equipment, consisting of a rubber raft, two long life-lines, rubber bags for food and clothing, a camera, hunting-knives, and belts. Until they reached the water-falls where the previous expedition had left the canyon, the "Fall of Sorrow," the first part of their trip possesses little of interest beyond what had been experienced before. But from this point on unknown dangers menaced them.

The roar of the plunging water from below rose upward with a deafening sound as they gazed into the seething current. The rising mists obscured the tree tops on either side far below. Should they press on or retreat, as those before them had done? Yes, they must go forward whatever the hazard. They clasped hands, bidding each other good-by. Torrence threw himself into the water first and Fellows followed. A few seconds later both clambered upon a bowlder in the pool below. The narrow cleft by which the former company effected their escape was passed and no alternative but to go forward was left to them.

They encountered many other perilous adventures in their thirty-mile trip. Before they escaped from the canyon their provisions gave out. Death by starvation stared them

in the face once more. Weakened by hunger and about to give up, they spied at the base of a cliff two mountain sheep.

Now, mountain sheep, which roam among the rugged crags, are exceedingly difficult to catch. One of the sheep darted into a cleft. With a quick movement born of desperation Torrence rushed before the opening, but scarcely had he reached the spot before the frightened sheep, in attempting to escape, jumped into his arms.

Realizing that his life and that of his companion depended upon securing the animal, he succeeded in killing it with his knife after a fierce struggle. The meat obtained saved their lives and sustained them until they reached a ranch fourteen miles from the place from which they emerged from the end of the canyon. In making the perilous journey they had swum across the river seventy-four times.

Although their instruments and most of the other articles which they had taken were lost, yet the valuable data, sought for and recorded in the engineering book, were safely brought out and contained enough encouraging information to lead the government to take up the project of diverting the waters of the Gunnison River to the Uncompahgre Valley.

Salt River Valley, one of the most fertile sections of Arizona, has been settled for many years, but the lack of a sufficient supply of water for extended irrigation has caused a large portion of this rich desert land to remain dormant. To meet the demand for more water in this valley the United States Government has just completed one of the greatest water impounding reservoirs in the world, the construction of which called for the greatest engineering skill and cost nearly nine million dollars.

Salt River enters the valley after a tumultuous passage through a deep and rugged canyon forty miles long. It

derives its name from the saltness of its waters, which results from the discharge of salt springs into the main stream as it courses through the gorge.

Though unsuited for drinking purposes the water does not contain enough salt to make it detrimental for irrigation, and the soil, stimulated by the water, produces marvellous crops. Here extensive farming can be carried on with the greatest success. Six crops of alfalfa, averaging eight tons per acre, are harvested yearly. The oranges, dates, figs, lemons, grape fruit, olives, and peaches grown upon these lands are of superior quality and flavor and yield abundantly. The climate during eight months of the year is unsurpassed.

Ostrich farming here is becoming an important industry. There are at the present time in the valley about eight thousand birds, and the number is rapidly increasing. The value of the feathers plucked yearly from each full-grown bird is from thirty dollars to forty dollars. Indications are that in the near future Arizona will lead the world in ostrich farming and the production of ostrich feathers.

The history of this remarkable reservoir is full of human and natural interest. It is located in a land whose civilization was old when Rome was founded, a land of lost races, perpetual sunshine, forbidding deserts, and picturesque wonders. Strange vegetation and scenes that are novel are reflected in soft, changing tints from plain and mountain. From dawn to dark they possess an indescribable charm.

The government engineers, in looking over the ground, found an ideal spot for a reservoir formed by two valleys hedged in among the mountains at the head of the canyon. It was necessary only to build a dam across the narrow cleft where the river enters the gorge in order to impound the water.

The place being practically inaccessible, much preliminary work had to be done before commencing construction on the dam. A road forty miles long was made through the rugged mountains by which to transport provisions, machinery, and other supplies. A greater part of the road was cut out of the solid rock; other portions were constructed of masonry. At places on this wonderful highway, a stone dropped over the edge of the road will fall almost a thousand feet without stopping. The scenery along the whole route is both beautiful and awe-inspiring.

The question of supplying cement for constructing the dam was for a while a difficult one; the price asked by the manufacturers was nine dollars per barrel delivered. The engineer then summoned to his aid the government geologists, and they discovered near at hand limestone rock suitable for making good cement. But in order to convert the limestone into cement, it was necessary to have a mill and motive power to run it. Coal mines were five hundred miles away and such fuel would be too costly. The engineer said, "Why not use as a power electricity generated by the river itself?"

Accordingly a canal extending twenty miles up the river was constructed; with a two-hundred-and-twenty-foot drop it was capable of delivering water enough to generate four thousand two hundred horse-power. A mill was built and an electric plant installed which ran the mill and machine shops besides furnishing power for laying the heavy stones, lighting the works and town, and leaving a large surplus amount for pumping water from numerous wells in the Salt River Valley fifty miles away. By the economy of self-manufacturing, the cost of the cement to the government was but two dollars per barrel, thereby making a saving of nearly half a million dollars.

To provide proper accommodations for all of the em-

Shoshone Project, Wyoming

Shoshone Canyon, looking upstream toward the dam. Dam, 328.4 feet high; storage capacity, 456,000 acre-feet

ployees and their families, a regular town was built on the floor of the reservoir, to be submerged when the works should be completed and the flood gates closed. The town, which was christened Roosevelt, contained a population of upward of two thousand, and bore the reputation of being the best behaved in all Arizona.

The dam, also named after Colonel Roosevelt, then President of the United States, floods two valleys, one twelve and the other fifteen miles long and each from one to three miles wide. The reservoir is nearly two hundred feet deep on the average. It is two hundred and eighty feet high, and the thickness of the dam ranges from one hundred and seventy-five feet at the bottom to twenty feet at the top, where its length is one thousand and eighty feet. Massive iron gates weighing sixty thousand pounds guard the outlet of the flood. To do the preliminary work and construct the dam nearly eight years were required, and during a part of this time a thousand men were employed both night and day, several hundred of whom were Apache Indians.

This region was previously the haunt of Chief Geronimo and his murderous band of Apaches. Near by are two groups of cliff dwellings formerly occupied by a race now extinct.

The capacity of this immense reservoir exceeds that of the Nile pent up by the Assouan dam, and the water would be sufficient to fill a canal two hundred feet wide and twenty feet deep, extending entirely across the United States from the Atlantic to the Pacific. When full there is sufficient water to submerge the city of Washington to the depth of thirty-four feet.

Among the other many important irrigation works may be mentioned the Shoshone and Rio Grande Dams. The Shoshone Dam in Wyoming impounds sufficient water to

irrigate one hundred and fifty thousand acres in the valley below. This dam was completed January 10, 1910, and is the highest in the world, its height being three hundred and eighty-four feet. Twelve miles below the dam proper a diversion dam was built across the river which turns the stream into a tunnel connected at the other end with a canal, which delivers water upon one hundred thousand acres of fertile land.

The Rio Grande Dam involving the construction of a storage dam opposite Eagle, New Mexico, across the Rio Grande River will irrigate one hundred and eighty thousand acres of land in New Mexico, Texas, and Mexico.

CHAPTER II

THE GRAND CANYON OF THE COLORADO

NOWHERE else on the face of the globe is one so vividly impressed by the vastness of the work of corrasion as in the northwestern part of Arizona. Here the mutilated breast of Mother Earth discloses a chasm from three thousand feet to seven thousand feet deep, cut through horizontal strata of sandstone, shale, limestone, and granite, chiefly by the agency of water.

This stupendous chasm is the Grand Canyon of the Colorado River. It is more than two hundred miles long; and from rim to rim its walls measure in places twenty miles across. It is not a clean-cut open channel from wall to wall, but, on the contrary, it is filled with castellated peaks, buttes, pinnacles, ridges, seams, and lesser canyons. Down deep in its lowest part, hurrying onward with impetuous speed, is the river itself.

Geologists tell us that this stream was an ancient river

before the Mississippi was born and that it formerly watered a valley as fertile.

Ages ago when Time was young the river found its channel closed by an obstruction—just how, or where, or by what, no one knows. So it spread out into a great lake, or, perhaps, into an inland sea several thousand feet deep. The rock waste carried into its basin hardened into sandstone—red, pink, and white of many shades.

After this great inland sea had become dry the Colorado River was born—just how, or when, or because of what, one can only guess. But when it was born it began to undo what its predecessor had done. It cut a channel in the surface of the sandstone and then began business in earnest. It loosened little pieces of sharp flint from the sandstone and swept them along with such force that each became a tiny mallet and chisel combined to cut and carry away other rock. And so it kept on until it had carved a passage not only to the original granite bed rock but in places a thousand feet or more into it. A few localities excepted, the canyon does not form a single gash; nor has it the usual V-shape of canyons in regions of plentiful rainfall. On the contrary, its cross-section takes the form of a succession of steps and terraces, as though the river cut the channels successively in decreasing widths. And because the region through which it flows is one of very slight rainfall, all the landscape outlines are bold and sharply angular.

All told, an area comprising two hundred thousand square miles has been denuded to the depth of six hundred feet, and the material borne southward by the Colorado and its tributaries, while the land through which they flow has been literally drained to death. Even the tributaries have formed deep lateral canyons that meet the level of the main stream. It staggers the mind to try to grasp the time ex-

The Grand Canyon of the Colorado

pressed in countless eons since the youth of this now senile river.

As early as 1540 Spanish explorers made known to the world the fact that a deep and impassable gorge existed in one part of the Colorado River, and again in 1776 a Spanish priest revived a knowledge of its existence.

Then, for many years afterward, the canyon claimed but little attention because it was so difficult of access, and so little was known of its colossal dimensions and the marvellous carvings within its walls.

Just above the Grand Canyon and continuous with it is Marble Canyon, so called because of the immense beds of marble that form a part of its walls. In both canyons the limestone sometimes takes the form of marble, or gypsum, or alabaster—crystallized forms of limestone which take a fine polish.

This remarkable river with its canyons was first explored by Major Powell in 1869. With nine men and four boats he started from a landing on Green River in Utah, floated down Green River to its junction with the Grand, and thence down the Colorado below the mouth of the Virgin to the Grand Wash. There he landed after having passed through the entire length of the canyon.

The time spent in this voyage was ninety-eight days, and the distance travelled was upward of one thousand miles. Four of his men left him when the voyage was but partly finished, being frightened by the perils that beset them. They were killed by Indians. The others, after many accidents and hair-breadth escapes, succeeded in getting through in safety.

In addition to the rapidity of the current the river has many rapids and water-falls with jagged projecting rocks which make boating extremely hazardous. All these perils were conjectured but unknown to Major Powell's party,

and every new bend of the river was liable to disclose a cataract more dangerous than any encountered before. Then the reverberating sound of the roaring river as it struck the sides of its lofty prison walls together with the deep gloom of the mighty abyss was calculated to terrify the bravest. Thus, facing death at every turn of the stream, the men were kept constantly in a tense state of excitement.

A wealth of adjectives has been expended in attempting properly to describe the immensity of this great handiwork of nature, and scores of persons have produced fascinating word-paintings of its awe-inspiring grandeur.

Leading back from the river the canyon walls are made up in part of shelving rocks and terraces. These, with peaks, buttes, and myriads of other structures arising from the great gulf, show plainly the different strata of rocks of which they are composed. Many of these rocks are richly colored; the tints as a rule result from the salts of iron and other mineral matter disseminated through them. In some instances the coloring material of the upper strata has been washed down by the storms and has stained the rock of the walls below. This is the case in the Grand Canyon, where the limestone wall is colored red by the iron in an overlying stratum.

When the gigantic forms partly filling the chasm, yet standing apart from each other, are seen near sunrise or sunset with their shifting shadows, they leave on the mind remembrances that will never fade.

To appreciate properly the magnitude and height of these towering masses one should examine them not only by travelling along the brink, but by descending to the river level in order to examine them from below. Then only will the awful grandeur and immensity of this monumental architecture of nature begin to dawn upon the understanding.

To the geologist this chasm is an intensely interesting book which reveals much of the history of the past in world-building.

Some years ago a company was formed in New York to build a scenic railroad through Marble and Grand Canyons. Engineers were sent out not only to make a careful survey of the canyons but also to make a series of photographs which should form a continuous panoramic view of the proposed route. A large sum of money was spent in making the surveys; then the project was abandoned. Possibly at some future time the scheme may be revived and a road be built, using as its motive power electricity generated by the river itself.

The Grand Canyon is now easily reached by the Santa Fé Railway system. From the main line at Williams a branch road extends to El Tovar, Grand Canyon station, which is located near the edge of the canyon. The descent to the bottom of the canyon can be made by several trails. Those noted for easy descent and the best views are Grand View and Red Canyon Trails from Grand View, Bright Angel Trail from El Tovar, and Bass Trail from Bass Camp. Each has its own special charms, and for one limited as to time it is difficult to make a choice.

The course of the Colorado and its tributary, Green River, presents some interesting problems. The latter has cut its channel directly across the Uinta Mountains, and the Colorado has sawed its channel to the base level of a series of plateaus, sometimes called the Sierra Abajo. And the interesting problem is—how was the sawing process accomplished? It needs only a moment's thought to understand that the river could not flow against the base of a mountain range and bore a passage through it, much less clear out an open passage miles in width.

Major Powell has shown how this mighty work of moun-

Grand View Trail

Looking toward Apache Point from Mystic Spring Plateau The Grand Canyon of the Colorado

tain cutting was accomplished; the sawing process was begun, not at the base of the range, but at its top. It is merely a question of age. The Colorado and its chief tributaries are older than the mountain uplifts which they have severed. Moreover, the level of their channels is much the same now as it was before the mountains were born.

The mountain levels, however, have been changing ever since their uplift began. And when the rock layers of which they are composed began to be pushed upward the uplift was so slow that the rivers cut downward just as rapidly. In time the ranges were pushed upward to their present height; but when the uplift was completed, in each case it was sawed to the bottom by the river. It is in very much the same manner that a huge log is cut in twain as it is pushed against the saw. The mountain range, as it is pushed upward, represents the log; the river, which is stationary, represents the saw.

One might look a long way to find the wealth created by this muddy torrent. But the wealth is there, though it is certainly a long way from the canyon; moreover, the rock waste itself is the wealth, and great wealth it is. The water of the river is very muddy. Dip up a bucket filled to the brim and allow it to stand for ten or twelve hours. There is an inch or two of clear water at the top, while at the bottom there is a thick, muddy paste of sand, clay, and red earth. All this rock waste the current is sweeping along to the Gulf of California.

Every overflow along the banks of its lower course spreads this rich, nutritious rock waste over the flood plain. Imperial Valley is filled with it; and this, together with the flood plain above and below, constitutes an area of productive land about as large as the State of Illinois. Moreover, the area is constantly increasing, because of the enormous

amount of rock waste which the river daily bears to the Gulf of California. In time, a long time as years are measured, the gulf will be entirely filled—and what a valley of prairie land there will be.

CHAPTER III

YELLOWSTONE PARK

In the northwestern part of Wyoming, at the summit of the continent, is a tract of land containing more than three thousand square miles. It is a region which attracts thousands of sightseers every year; yet inconceivable as it may now seem, this marvellous region was unknown to the world until 1870. Being difficult of access, because flanked by high mountains on all sides, and possessing no mineral deposits of value, there was but little inducement for any one but a hunter or a trapper to penetrate it.

John Coulter, a frontiersman, was probably the first white man to set foot within its territory. He was a member of the Lewis and Clark Expedition and, having observed that there were many beavers in the headwaters of the Missouri River, desired to try trapping there. Having obtained permission to leave the expedition before its return to St. Louis, he forthwith set out to hunt and trap in that region. This was in 1807.

While following his favorite employment he met with many strange and exciting adventures with both Indians and wild beasts. And during his wanderings he beheld sights so marvellous as to tax the credulity of even his own senses; among them a glass mountain, geysers sending up great volumes of water hundreds of feet high into the air, boiling hot springs, deep and gorgeously painted canyons,

stupendous water-falls, curiously colored rock formations, and a mountain lake filled with the finest of fish.

So well versed was he in woodcraft that he could travel through pathless forests and over rugged mountains as unerringly as by well-beaten trails. A love for wild nature and adventure had become his ruling passion. After hunting and trapping for several years he returned to St. Louis. Here he told his friends the marvels that he had seen and his adventures with Indians and wild beasts; but his hearers being doubting Thomases, listened with incredulity to his astonishing stories.

He related his experiences and what he had seen to an editor of a St. Louis paper, who, after listening patiently to the narrative, informed Coulter that his wonderful adventures, glass mountain, and boiling springs among the snows were falsehoods and could find no place for publication. Coulter gave interviews to many other persons, and stuck so persistently to his statements that the region which he had so minutely described was derisively dubbed "Coulter's Hell."

Coulter's experiences certainly were marvellous. On one occasion, when he and a companion were trapping along the Madison Fork of the Missouri River, they were surprised by a company of Blackfeet Indians who killed his friend but spared his life for the time being. After the Indians had consulted for some time in regard to what should be done with Coulter, the chief asked him if he could run fast. Coulter replied that he could not. He was in reality the fleetest runner among the western hunters, but he told the Indians that he could not run fast, since he concluded that there was a chance of saving his life by running should he be given the opportunity.

He was stripped naked and taken several miles away to give the Indians some sport before killing him. Then the

The Yellowstone National Park, Wyoming
Looking down canyon from Grand Point

chief commanded his followers to remain back while he led the captive some three hundred yards in front of them. At a given signal he told Coulter to save himself if he could. At once the war whoop resounded and six hundred demons were on the track of the fugitive. Coulter strained every nerve to outdistance his murderous pursuers. His great exertions caused the blood to spirt from his nostrils and smear the front of his body.

After running a while he heard footsteps, and turning saw an Indian with a spear but a few yards behind him. Being exhausted, and fearing that at any moment the spear might be hurled at him, he concluded to surprise the Indian. Stopping suddenly he wheeled about and presented his bloody body and outstretched arms to the Indian.

The red man, greatly astonished, in attempting to stop quickly stumbled and fell, breaking his spear. Before the prostrate runner could recover himself Coulter seized the head of the shaft and quickly pinioned his foe to the ground.

Then the fleeing hunter ran at his topmost speed toward the river, about a mile distant. Arriving there a little ahead of his pursuers, he plunged into the water and swam as fast as he could. Observing a raft of drift-wood that had lodged against a small island, he dived under the débris, and thrusting his head up between the tree-trunks of the heterogeneous mass succeeded in getting into a position where he could breathe and yet be concealed.

No sooner had he hidden himself than the yelling savages appeared on the river's bank. They looked in all directions for their missing captive, but in vain. They even went on the island and climbed over the drift-wood, scanning every possible place of concealment. Seeing no trace of their white prisoner they reluctantly returned to the mainland. Coulter remained under the raft in dreadful suspense until night, when, hearing nothing of his foes,

he silently slipped from under the raft and swam down stream a long distance before landing.

His situation was now indeed a desperate one; his feet had become filled with thorns from the prickly pear while running across the prairie; he was also naked, hungry, and without means to kill the wild game for food; moreover, the distance to the nearest fort was at least a seven-days' journey. But he was in excellent physical condition and, being inured to hardships and skilled in traversing the pathless wilderness, he at length reached the fort, having subsisted in the meantime chiefly on roots whose nutritious value he had learned from the Indians.

John Bridger, a famous hunter, was familiar with the region now known as Yellowstone Park as early as 1830, and he endeavored to have his descriptions of it published, but he could find no periodical or newspaper willing to print his statements. In Bridger's case, however, there was ground for doubt, inasmuch as he had a reputation for exaggeration, and the facts that he related about the wonders of the Yellowstone were considered mere fabrications.

One of his most astounding stories concerned an elk. He claimed that while hunting he espied an elk that seemed to be only a short distance away; taking a good aim he fired, but the animal was unmoved by the shot. He again fired with more deliberation, yet with the same result as before. Having fired twice more with no effect he seized his rifle by the barrel and rushed toward the antlered monarch; but all at once he ran up against what seemed to be a high vertical wall. On investigation the wall proved to be a mountain of perfectly transparent glass. And still the elk kept on grazing quietly!

The strangest thing about the mountain he said was that its curved form made it a perfect telescopic lens of

great power. On going around to the other side of the mountain he caught sight of the elk, which he judged must have been at least twenty-five miles away when he first saw it by the powerful glass-lens mountain!

In 1860–61 gold was discovered in Montana, and prospectors began to extend their search for the precious metal into adjoining territory. The Indians were troublesome; nevertheless many prospectors ventured into the region of the Upper Yellowstone during the years succeeding, and reported seeing wonderful volcanic agencies at work.

To settle the many flying accounts about volcanic wonders in the Yellowstone section, two expeditions headed by prominent citizens of Montana were formed to ascertain the truth concerning these statements. The expeditions set out during the consecutive years 1869 and 1870. On their return excellent descriptions of what they had seen were published in the Montana papers, and these accounts were copied by the leading papers of the country.

The second, or Washburn-Doane, expedition of 1870 was the most successful in its explorations, since it was provided with a military escort. One of the members of this expedition wrote up a series of excellent articles which were published in *Scribner's Magazine,* thus giving further authenticity and wide publicity to the discovery.

In 1871 interest awakened by the last expedition caused the United States Government to send out a special expedition of geological and engineering men to collect exact data, take photographs, and make a survey of the Yellowstone region. The geological section was under the direction of Dr. P. V. Hayden. Mainly through Hayden's influence and foresight Congress withdrew the tract now comprising Yellowstone National Park from occupancy or sale, and dedicated and set it apart as a public park or pleasure ground for the benefit and enjoyment of the

people. The bill was signed by the president March 1, 1872. In 1872 two United States geological surveying parties were sent out and detailed explorations were made during the next ten years.

The park is now under the management of a military commander as acting superintendent, aided by a detachment of United States troops, who maintain order, prevent acts of vandalism, and see that the rules and regulations of the park are obeyed. No one except the troops is allowed to bring firearms into the park, and the wild animals, now carefully protected by law, have greatly multiplied. Through subsequent acts of Congress two forest reserves have been added to the park proper, the Madison Forest Reserve in 1902 and the Yellowstone Forest Reserve in 1903. These additions make the total area reserved from settlement about seventeen thousand six hundred square miles.

The only living beings that are permitted to fell as many trees as they wish are the beavers, which use them in constructing their dams. The grizzly and the black bear flourish in the park and have become quite tame. In the neighborhood of the camps and hotels they have become an intolerable nuisance because of their propensity to break into tents and buildings in search of food.

The lordly elk flourishes here and numbers of them may be seen at almost any time of day. A herd of buffaloes is jealously protected, and food and shelter are provided for them during the winter when necessary. These animals are increasing in numbers. Many antelope, deer, and mountain sheep are seen in the park.

The mountain lion and the coyote are two animals that the authorities of the park feel justified in killing in order to preserve the other game, but the wild ruggedness of the territory, which affords these pests ample opportunity to multiply unmolested, prevents their extinction.

During the fall of the year wild geese and ducks frequent the park in great numbers; some of the latter remain all winter long in places where the hot springs keep the water of the streams from freezing. The United States Fish Commission has taken special care in stocking the fishless streams with trout, and now the Yellowstone Park furnishes the finest trout-fishing in the whole world. Visitors to the park are granted full license to fish, but they must use only hook and line.

About one-fifth of the reservation consists of tracts suited for grazing, but for agricultural purposes the park is worthless, since frosts occur every month of the year.

The forests consist of a variety of trees, but only one kind, the Douglas spruce, is suitable for good lumber. The quaking aspen is the only deciduous tree that is abundant. Elk and deer browse about these trees and keep them trimmed at a uniform distance from the ground.

During the long rainless season the distant hills and mountains are bathed in an atmosphere of soft purple and blue in ever-varying intensity, while later in the season Jack Frost with his magic brush paints the mountain-sides with the most varied and gorgeous colors, and the aspen changes to rich autumnal tints.

At the proper season Yellowstone Park is a vast garden of wild flowers which are dense and rich in colors even up to the snow line. Several varieties of the lupine and the larkspur clothe the hillsides with every shade of color, while the modest violet seeks secluded spots in which to bloom. Forget-me-nots, geraniums, harebells, primroses, asters, sunflowers, anemones, roses, and many other plants are abundant.

The climate puts new life and energy into the visitor. Contrary to the general opinion, the climatic conditions in the park are not extreme, notwithstanding its high elevation.

The average temperature at the Mammoth Hot Springs in January, the coldest month, is 18° F., and in July, the hottest month, 61°. In the plateau regions, averaging fifteen hundred feet higher, the temperature is 8° in January and 51° in July.

Good roads have been constructed throughout the park connecting all points of interest, and in many instances these roads have been built at an enormous expense. The United States Government has already expended upward of one million dollars in road-making and bridge-building. There are now over sixty bridges and five hundred culverts to supplement the five hundred miles of roads within the park proper and the forest reserves.

We enter the park from the north and then proceed to visit a few of the most interesting places. Our tour embraces Mammoth Hot Springs, Norris Geyser Basin, Firehole Geyser Basins, Yellowstone Lake, and the Grand Canyon of Yellowstone River.

Leaving the Northern Pacific train at Gardiner, the entrance station to the park, we take a coach for Mammoth Hot Springs, five miles distant, and ride along the foaming, dashing Gardiner River through a canyon bearing the same name. Portions of the way unfold bold, picturesque scenery, giving a fitting introduction to the marvels and greater scenic beauty that are in store for us. We cross the river four times on steel bridges within one mile.

Just after crossing the last bridge we see an immense stream of hot water issuing from an opening in the rocks and discharging directly into the Gardiner River. This stream, the Boiling River, we are told, comes through subterranean channels from the famous Mammoth Hot Springs a mile and a half away.

Arriving at the springs, we find here a large, well-equipped hotel, where are also the administration head-quarters of

the park. After resting a short time, we visit the world-renowned Hot Springs.

The Mammoth Hot Springs rise from the summit of a hill of limestone formation three hundred feet high, built by the deposit of mineral matter held in solution by the hot water that issues from them. The terraces, containing upward of two hundred acres, are delicately tinted in beautiful shades of red, yellow, orange, brown, and purple. Those over which the water is still flowing present the most attractive appearance, the colors being fresh and rich; the others have dull, ashen colors.

Calcareous deposits are rapidly building up these terraces in various beautiful forms, the edges of many being supported by delicate columns, some of which resemble organ pipes. Different names are given to the terraces according to form or fancy, as Pulpit Terrace, Jupiter Terrace, Narrow Gauge Terrace, Minerva Terrace, etc.

The overhanging bowls built up by these deposits are exquisite specimens of Nature's work and are filled with water of wonderful transparency; while the variety of forms of these receptacles and their charming colors fascinate the beholder.

Scattered over the formation in all directions are numberless curiosities, such as the Devil's Kitchen, Cupid's Cave, and the Stygian Cave. In many of these caves there is an accumulation of carbonic-acid gas sufficient to destroy animal life. This is especially true of the latter cave.

We now journey by coach to Norris Geyser Basin. On the route we pass by Obsidian Cliff, sometimes called Obsidian Mountain, which is an immense mass of black volcanic glass. This mineral was used by the Indians for making arrow-heads and spear-heads.

In constructing a road around the base of the cliff, great

difficulty was encountered on account of the hardness of the obsidian. The superintendent in charge of the work hit upon a happy device by which to quarry it. Log fires were built along the base, and when the volcanic glass was hot cold water was thrown upon it. This method cracked the material into fragments which were easily removed.

The Yellowstone National Park, Wyoming
Mammoth Hot Springs. Summit Pools

Opposite the base of Obsidian Cliff is Beaver Lake, the home of numerous beavers and a great resort for water-fowl during a part of the year. After passing Obsidian Cliff, hot springs become more numerous until we reach Norris Geyser Basin. In this locality the odor of sulphur is strong and unpleasant. A little farther on a loud roar startles us, and a few moments later we see the cause of the explosion; it is a powerful steam jet issuing from the

summit of Roaring Mountain. When Dame Nature "turns on steam" there is no nonsense about it.

Norris Basin seems to be of more recent volcanic development, since some of the steam vents in other basins have ceased action during the past few years; moreover, several new ones have opened, one of which rivals Roaring Mountain. Constant and Minute-Man Geysers, though small, are frequent and vigorous in action. In passing through this section the road-bed is hot for some distance, showing that the subterranean rocks which heat the water cannot be very deep down in the earth.

In going to the Firehole Basins we follow Gibbon River to within four miles of its mouth, then, crossing a point of land to the Firehole, we ascend the right bank of the stream to Lower Basin. On the road we pass many springs; the most conspicuous of which, Beryl Spring, lies close to the road. It discharges a large volume of boiling water and the rising steam frequently obscures the road.

In one locality outside the beaten track of tourists there is a veritable Hades on earth. Here, as we walk over ground that is very hot, we are nearly suffocated by the fumes of sulphur. All around us are hundreds of seething, boiling vats of water, and the whole area is cracked and filled with holes from which noxious vapors rise.

Soon after we leave this infernal region we hear a constant roar like that coming from a large steamer about to leave its moorings. We follow in the direction from which the sound proceeds and at length discover the cause.

On approaching the source of the sound we see a large volume of steam rushing with immense velocity from an opening in the ground, while the rock around the orifice is black as jet. The guide tells us that this huge steam vent

is called the Black Growler, and that it continues vigorously active summer and winter, year in and year out. Its roar can be heard four miles away.

The chief wonder of Lower Firehole Basin is the Great Fountain Geyser. Its formation is unique. At first sight

The Yellowstone National Park, Wyoming
Beehive Geyser

one is led to believe that the broad circular structure which he sees is artificial. On close inspection numerous pools, moulded and nicely ornamented, are seen sunk in this stone table, while in the centre there is a large and deep pool filled with hot water, but looking like a beautiful spring. At the time of eruption this central pool of water is shot up to the height of one hundred feet or more. Near the Great

Fountain Geyser is a small valley in the upper part of which is a large hot spring called the Firehole.

When this spring is visited on a windless day, a light-colored flame seems to be constantly issuing from the bottom, flickering back and forth like a torch, and the visitor feels sure he is gazing at the hidden fires beneath that heat the water. It is the illusion caused by superheated steam escaping through a fissure in the rock and dividing the water. The reflection from the surface thus formed and a black background formed by the sides and bottom of the pool account for the phenomenon.

Surprise Pool is found near the Great Fountain; it will make good its name should you throw into it a handful of dirt. Excelsior Geyser, not far away, is really a winter volcano, its crater being a seething caldron near the Firehole River, into which it sends six million gallons of water each day, even when not in eruption.

At times it sends up a column of water, fifty feet in diameter, to the height of two hundred and fifty feet. The eruptions take place at long intervals—seven to ten years. On account of the great depth and extent of this geyser it has sometimes been denominated "Hell's Half-Acre."

Following along Firehole River we pass into the Upper Basin, a section the most popular with the majority of tourists. Among the geysers in this basin we shall find Grotto, Castle, Giant, Giantess, Bee Hive, Splendid, Grand, and Old Faithful. Each of them has an interest peculiarly its own, but Old Faithful is always true to its name and is perhaps best appreciated by visitors.

The opening through which Old Faithful disgorges its water is at the summit of a mound built up by its own exertions. The wrinkles on its face tell of long-continued service. Every seventy minutes this faithful worker sends up a column of water to the height of one hundred and

eighty feet, and at each eruption more than one million gallons of water are thrown out.

We now pass through a section noted for its wild and picturesque scenery and considered the pleasantest on the trip. In leaving the Upper Basin we follow along Firehole River to the mouth of Spring Creek, then along this creek to the Continental Divide. From there, travelling a few miles along the Pacific slope, we cross the Divide and descend the mountains into the valley of the Yellowstone.

Near the central part of the park, encircled by a forest and elevated nearly eight thousand feet above the sea-level, lies a remarkable body of water supplied by ice-cold streams formed by the melting snow on the surrounding mountains. This body of water, of which the Yellowstone River is the outlet, is the famous Yellowstone Lake, thirty miles long and twenty miles wide; it is filled with trout.

Here the fisherman can catch hundreds of trout in a short time, but unfortunately most of them are afflicted with a parasitic disease, rendering them unfit for food. Researches have been made seeking the cause of the disease in order, if possible, to apply a remedy, but so far to no purpose. It is conjectured that the superabundance of fish together with a dearth of suitable food lowers their vitality, thus rendering them liable to disease.

Yellowstone stands next to Lake Titicaca as the highest large body of water in the world. The sunrise and sunset effects on the lake are most beautiful. A steamer plies on the lake carrying mail and passengers. The bird life on this body of water and its shores is represented by swans, geese, ducks, cranes, pelicans, curlews, herons, plovers, and snipe.

For beauty and grandeur the lower falls and canyon of the Yellowstone River are unsurpassed. A body of water seventy feet wide rushes forward with impetuous speed and

joyously takes a leap of more than three hundred feet to the rocks below, where, breaking into millions of particles, it forms a great cloud of spray. The water then dashes on with renewed vitality between the walls of a canyon fourteen hundred feet deep, and most gorgeously painted by nature in such a variety and lavishness of tints that they defy the most skilful artist to reproduce them.

As one gazes from the edge of the chasm into and along the depths below, he attempts in vain to measure the fulness and beauty of this handiwork of nature. He is too amazed for utterance and remains spellbound, communing only with himself and nature regarding the unfathomable significance of such marvels. When the famous painter, Thomas Moran, desired to reproduce in colors on canvas this masterpiece of nature, he gathered his inspiration from Artist Point, and after he had finished the celebrated painting which now adorns the Capitol at Washington, he acknowledged that the beautiful tints of the canyon were beyond the reach of human art.

The Grand Canyon of the Yellowstone has no equal on the face of the globe. With a breadth equal to its depth, this richly decorated canyon stands out unique among the world's wonders. Its beautiful panorama of stained walls, down which trickle streams of water which brighten the tints in some places and soften them in others, extends for a distance of three miles. The entire canyon is fifteen miles in length.

A most interesting place to visit, but outside the itinerary of most tourists, is the Fossil, or Petrified, Forest. This section, especially attractive to the scientist, lies in the northeastern part of the park just north of Amethyst Mountain.

To one who can read Nature's books, a wondrous volume is open, disclosing in its strata the hidden secrets of

many by-gone geological ages. Here on the north flank of the mountain are two thousand feet of stratifications. On the ledges, tier above tier and story above story, are seen the opal and agate stumps and trunks of twenty ancient forests, some of the trunks being ten feet in diameter.

What wonderful stories do they tell of life and death, of flood and volcanic fire, ranging through the eons of the past! So perfect are these petrifactions that the annual rings can be easily counted and even the grain of the wood is plainly visible.

As one traverses this wonderland he is impressed by the evidence of the stupendous forces that lie smouldering beneath the crust of the earth. It is not improbable that at some future time, by the further wrinkling or sinking of the surface of this part of the American continent, the slumbering volcanic fires may be awakened to new life and activity.

CHAPTER IV

TWO PREHISTORIC CEMETERIES—GIANT REPTILES AND GIANT TREES

ALTHOUGH reptiles appeared first in the period known as the Carboniferous Age, or age of plant life, they did not attain their greatest development until Jurassic and Cretaceous times, when many were of prodigious size and ruled the world. The gigantic ichthyosaurs, mesosaurs, and dinosaurs held dominion over the sea and land, and the monster flying reptile, the pterodactyl, over the air.

Ages ago a great inland sea embracing Wyoming and the surrounding region occupied the area east of the Rocky Mountains. For many years students of geology had found this section a fertile field for the study of rock forma-

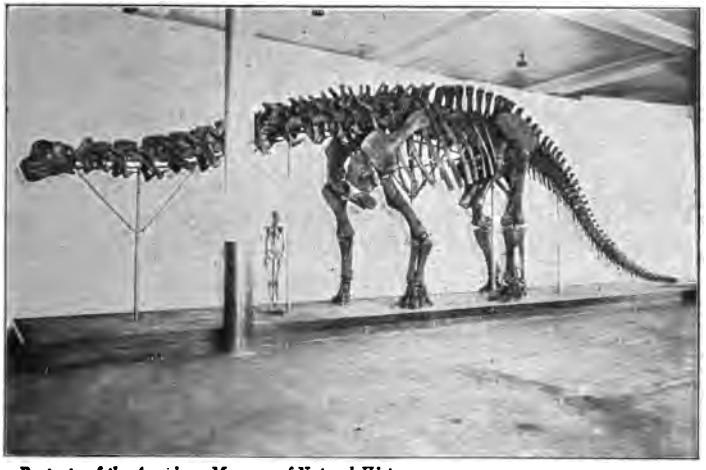
tions and the collection of fossils; but not until 1898 was the geological wonderland of central-south Wyoming discovered.

This discovery proved to be a graveyard of prehistoric monsters dating back probably several millions of years ago. Entombed in the rocks of the Jurassic and Cretaceous periods, many lizard-like animals of gigantic size called saurians were found. Several fossil skeletons of these animals have been chiselled out of the solid rocks and mounted in museums, the work entailing a vast amount of labor and expense. The discovery was made by Mr. Walter Granger, who had been sent out by the American Museum of Natural History, of New York, to hunt for fossils.

In the desert section near Medicine Bow River, Wyoming, he found what seemed to be a number of dark-brown bowlders. On a critical examination they proved to be ponderous fossils that had been washed out of a great bed of reptilian remains. The fossil graveyard in question was found to be two hundred and seventy-five feet in thickness. Near by was a Mexican sheep-herder's cabin, the foundations of which were constructed of huge fossils. The vicinity was christened Bone Cabin Quarry. Ten miles south of the Bone Cabin Quarry, in the Como Bluffs, another bed containing the remains of huge dinosaurs was discovered. From these remarkable cemeteries many fossils have been obtained.

The term saurian means "lizard," and it has many prefixes to indicate the different genera and species. The prefixes generally express to a certain extent the characteristic appearance or habits of the different kinds of saurians. Some were flesh-eaters; others were herbivorous. Some lived on land; others, in the shallow waters and lagoons, fed on succulent aquatic plants; still others frequented the deeper waters and lived on fish.

The name dinosaur, meaning terrible lizard, represents an order of fossil reptiles. They are allied to the crocodile, but, like the kangaroo, their hind legs were much longer than their front ones. The neck and tail were very long and the body short but of immense size. These monsters were from twenty to eighty feet in length and weighed from



Property of the American Museum of Natural History

The Brontosaurus (herbivorous dinosaur)

thirty to one hundred tons. The long, slender neck supported a small head that contained a correspondingly small brain, from which it is thought that the creature possessed a low order of intelligence. The tail was much thicker than the neck and in some species was flattened. When rising on its hind legs and resting on its tail it could look into the window of a four-story building. Some of these strange animals had bills like those of a duck; some possessed teeth for grinding and others sharp teeth for tearing. These were by far the largest land animals that ever lived. The

different species often waged titanic battles with one another for the supremacy of the earth.

It is conjectured that their disappearance was due to violent upheavals of the earth, to the draining of the water, to changes of climate, and to deprivation of suitable food.

The mounted brontosaur in the American Museum of Natural History, New York, will enable one better to appreciate the size of these giants of the ancient world. This typical specimen, though not the largest found, is sixty-seven feet long and stands fifteen and one-half feet high. Its neck measures thirty feet in length and its tail eighteen. The body weighed about ninety tons. This huge fossil, enclosed in its stone matrix, was sent from the quarry to the museum. After it had been received two men were employed constantly for nearly two and one-half years in removing the matrix, repairing, and mounting the fossil.

Let us turn now to the burying ground of a giant forest. Long, long years ago, before man appeared on the earth, an inland sea occupied what is now the northeastern part of Arizona. It was a sea bordered with sandstone and surrounded by coniferous forests, where stately trees nodded in the breezes.

At length there came a great change. The rim of the basin gave way, and the great volume of water, freed from restraint, overwhelmed the forest with earthy material, prostrating and burying it deep beneath the flood of sand.

In time the woody structure disappeared, and was replaced by beautifully stained opal and agate. Again, in the lapse of time the old forest bed was once more lifted above its former level, forming a mesa, or plateau, of considerable extent. During subsequent ages, the elements scarred and furrowed the plateau, forming canyons, gulches, valleys, and buttes, thus revealing in part this ancient forest.

Could these dead trees but talk, how interesting would be their story! We can read their history but imperfectly by examining the mutilated breast of Mother Earth, in and on which lie these mute stone trees, dead yet made more beautiful through their transformation.

This region is called the "Petrified Forest," or "Chalce-

Property of the American Museum of Natural History

The Allosaurus (carnivorous dinosaur)

dony Park." It is about one hundred square miles in extent, and is visited annually by thousands of people from all parts of the world. On account of its strange geological character it is of special interest to the scientist.

Let us make a brief trip to this wonderful stone forest. We take light hand-baggage and board a Santa Fé train. The railway passes near the most interesting part of the forest, and we change cars before entering Arizona in order to take this line. The railway officials have made a station at Adamana, six miles from the edge of the forest, in order to

accommodate the travelling public. We leave the train here and procure a team to carry us to the forest.

Unless informed of what is to be seen one is apt to be greatly disappointed. One's idea of a forest is usually that of a timber-covered area in which the trees stand erect, with outspreading branches; but we look in vain for a standing tree, or even a stump that is erect.

All are branchless trunks, prostrate on the ground, many wholly or partly buried; moreover, they are lying in all sorts of positions, some entire and others broken into sections; some are massed closely together; others lie apart; and millions of pieces of all sizes are scattered around. At places we can travel a long distance by stepping from one log to another.

But what is that pile of variegated disk-like objects looking like the primitive Mexican ox-cart wheels? They are cross-sections of stone logs, some large and some small, seemingly thrown together carelessly. It is a characteristic of petrified trunks to break into cross-sections or blocks, varying from a few inches to several feet in length; and this tendency prevails here.

We are told that the trees of this forest antedate those of the Yellowstone Park by a long period of time. How the loftiest flights of the imagination are piqued as we contemplate the marvellous changes since this primeval forest depended on the soil and sun for their life-giving elements! As we wander through this wonderful forest our feet seem to be treading on the rarest gems. And well may it seem so, because when polished these pieces display a beauty of coloring and a lustre that rivals the glint of precious stones. There is no other petrified forest in the world in which the mineralized wood assumes so many varied and interesting forms and colors.

Many years ago a firm at Sioux Falls undertook to manu-

facture table tops, mantels, pedestals, and various decorative articles out of sections of this agatized wood by cutting them into the desired forms and polishing them. Tiffany and Company, the famous jewellers, also used this material for the base of the beautiful silver testimonial presented to the French sculptor, Bartholdi.

At a later date, an abrasive company of Denver conceived the plan of grinding up these trunks to make emery because of their extreme hardness; in fact, a plant was shipped to Adamana station for that purpose. Fortunately for the public, however, it was not put into operation because the company learned that a Canadian firm had put on the market an article at such a reduced price that to grind up these beautiful logs would be unprofitable.

Fragments, branches, and trunks of all sorts and sizes are found lying around, many of them richly colored, forming chalcedony, opal, and agate; some approach the condition of jasper and onyx.

Before the Petrified Forest was set aside as a national park by Congress, many acts of vandalism were committed, to say nothing about the quantities of mineral carried away by manufacturing firms and curiosity-hunters. Keepers now have charge of the park, and no one is permitted to take away specimens for commercial use. Previously many of the finest logs were destroyed by blasting in order to procure the beautiful crystals which are found in the centre of many of them.

One object of special interest in the park is the National Bridge, a petrified trunk which spans a chasm thirty feet wide and twenty feet deep. The part of the trunk crossing the gulch lies diagonally and is forty-four feet long. The length of the trunk exposed by erosion is one hundred and eleven feet; a fraction still remains embedded in the sandstone.

The ruins of several ancient Indian pueblos are scattered about the park, nearly all of them built of logs of this richly colored, agatized wood. The forest was a storehouse for ages, whence primitive men obtained material from which to make agate hammers, arrow-heads, and knives, as is shown by implements found hundreds of miles distant from these quarries.

CHAPTER V

DEATH VALLEY

DEATH VALLEY, or the Arroyo del Muerte, as the Spanish called it, is in the eastern part of southern California, near the oblique boundary of Nevada, a little way north of Nevada's vanishing point. Nowadays one may ride almost into the valley in a Pullman coach. From Daggett, a forsaken station of the Santa Fé Railroad, a "jerkwater" road, as it is called, extends northward to Goldfield and Tonopah, and this road takes one almost as the crow flies to the edge of the valley of the ominous name.

Even in a Pullman coach the trip is trying to both body and soul. But forty years ago?—well, that is a different story. Then there was no Santa Fé Railway, and no Daggett—just a wide stretch of desert dotted with yucca and Spanish bayonet. Prospectors and pack-trains had left trails here and there. One of these, now a wagon-road, lay southward to San Bernardino; northward it lost itself in the desert toward Candelaria.

The region possesses some names that are a trifle paradoxical. For instances, there are the Black Mountains, the grayish red color of which belies their name. Then there is Funeral Range, which, far from being sombre in

aspect, is most brilliantly colored. To the southward is Paradise Valley, a plain desert strewn with greasewood and chamiso; and down in the floor of Death Valley is, or rather was, Greenland. But Greenland is not a waste of ice-bound coldness; on the contrary, it is averred by the laborers in the borax fields to be several degrees hotter than any other place on earth. The surplus water of the spring is employed to produce verdure there, and it is apparently equal to the task, for the forty or more acres so irrigated produce wonderful crops; hence it is "Greenland."

Even twenty years ago the trip to Death Valley was a trying one to the experienced desert traveller in summer; to the tenderfoot without a guide it was almost certain death. The best equipment for the trip was a pair of mules, or else cayuse ponies, and a light buckboard with broad tires—tires so wide that they would not sink in the loose, wind-blown rock waste. The equipment might possibly be found in Daggett; more likely it must be purchased in San Bernardino.

At all events, Daggett was the real starting point, and the first "trick" in the journey was the crossing of Mohave River. The river was pretty sure to be deep—not with water but with sand. Whoever saw water in the channel, or "wash," of the Mohave? Perhaps the oldest settler may have seen it; at any rate he will so claim, for the oldest settler is always boastful; indeed, fairy-story telling is his inherent, bounden right. To make good his assertion he points to the bridge, and certainly the bridge is there; but as for the river, it may be on hand one day —perhaps an hour or so—in ten, twenty, or thirty years!

Beyond the river a wide expanse of desert is before us, and then a beautiful lake comes into view. Real water, is it?—no; just the desert mirage, but it seems real enough to quench a genuine thirst. But the illusion is lessened by

the surroundings, for we are approaching a dry sink—an old lake-bed that was filled with brackish water once when a cloud-burst that occurred in Calico Mountains had its busy day.

Back of us are Calico Mountains, a picturesque clump of buttes, and the glimpse of them we get from the north explains why they were so named. And such colors! Their brilliant hues change like kaleidoscopic patterns with the sun's motion. On our right a trail diverges to Coyote Holes, made grewsome by one of many tragedies that have occurred in the region. This time it was a hold-up. A desert waif out of luck and ready cash waylaid the paymaster of Calico mines and relieved him of the money intended for the miners. The robber was soon trailed and he quickly discovered that his only safety lay in hiding. But where could he hide in that desolate flat?

At Coyote Holes there is a spring and a small marsh. The robber buried himself in the mud till all but his face was covered and lay there while the posse searched. But the keen vision of an Indian scout did not fail. When the robber saw that he was surrounded, he put up a brave fight and went down, riddled with rifle-balls. The money was recovered.

A little farther on is Garlic Springs. It is a common camping-place and like other camps is plentifully strewn with the evidence of the prospector's outfit—hundreds and hundreds of empty tin cans. In time we camp at Cave Springs in a little cove of the Avawatz Buttes. Once there came along a man who all said was half-witted. Perhaps he was, but his intelligence was keen enough to prompt him to claim the springs. By selling the water for quenching thirst at the rate of "four bits" a head for stock and "two bits" apiece for men, his spring proved the best gold mine in the district.

There is no water ahead until we reach Saratoga Springs, a dozen miles beyond, and it is well that we take a small supply along, as the water there is unfit for either man or beast. There is a difference between Saratoga Springs, New York, and the springs bearing this high-sounding name in the Amargosa sink.

Boiling Springs are a night's ride—perhaps twenty miles—beyond. We give our team three hours of rest and start therefor, stopping in the mean time for a midnight

Twenty-mule borax team

feed, where most unexpectedly we find some excellent grazing for our horses. By daylight we are at the Springs and in a locality much like the Bad Lands of South Dakota. But the "boiling" industry apparently is taking a vacation, for the water is not too warm for one's hands and face—and certainly it is refreshing.

We are in a "sink," or the dry bed of a lake, and the cliffs of clay have been sculptured into existence by the Amargosa River. Sometimes, when a dissipated cloud tumbles its contents into the region, the Amargosa is filled bank full with water; but few prospectors have seen more than a trickling stream flowing in its bed.

We turn our way out of the wagon-trail toward Funeral Range to find the canyon of Furnace Creek, and in time we are clambering up a narrow gulch between the multi-

colored strata of clay buttes. Not a vestige of life, not even the horned-toad or the trail of the kangaroo-rat is to be seen. Half a dozen graves marked each by a wooden cross or a rock monument are in sight. Who are they? Ask the simoom that sweeps like a cruel furnace blast over this forsaken region. To be lost in this desert means horrible suffering, phantom-seeing, and then death. The bodies of these unfortunates were merely found and buried—lost!—dead!

We cross the mesa which forms part of the Funeral Range. Telescope and Sentinel Peaks beyond Death Valley in the Panamint Mountains loom above the horizon; we descend the canyon of Furnace Creek and are in Death Valley.

We are in a strange and weird depression of the earth's crust about fifty miles long and ten wide, the deepest part of which is more than two hundred and fifty feet below sea level. Once upon a time, it is thought, the Gulf of California reached so far inland that it included this gash. Then the never-ceasing winds bridged it with loose rock waste. Thus, Death Valley was born. In time it became a salt lake, a marsh, and then a dry sink.

It is here that the deadly side-winder travels by night instead of day to avoid the excessive heat, and rivers flow with their bottoms up as if to hide from the burning rays of the sun; where Death by name and by nature gives forth a warning note, and even a mountain range on the east side of the valley signifies the service held to commemorate the last resting-place of the unfortunates who have perished here.

The valley is hemmed in on the east by the precipitous side of the gorgeous-colored Funeral Range, and on the west by the Panamint Mountains, which rise to the height of ten thousand feet. The climate is cool and salu-

brious in winter, but is a fiery furnace in summer, when the mercury in the thermometer sometimes climbs to one hundred and forty degrees in the shade.

Death Valley gained its name from a terrible tragedy that occurred during the early days of the gold excitement in California. Emigrants bound for California overland were wont to follow the same general route as far as Salt Lake City. From here there were two routes, one westerly along the route over which the Central Pacific Railway was afterward built, the other southerly into southern California.

Late in the season of 1849 one of the emigrant parties reached Salt Lake City. Rather than winter there, however, they determined to push forward at all hazards by the southern route. After travelling through Utah and some distance in Nevada, they left the regular trail and decided to turn southwesterly and cross a fairly level mesa. The region was unknown to them, but they believed that by thus changing the route they would be able to reach their destination more quickly. They also thought that they would find better grazing for their stock. After they had crossed the mesa, the route became more rugged and more precipitous, so, in order to lighten the wagon-loads, one by one many articles of furniture were left behind.

When the company reached the head of Amargosa Valley they began to separate. At length one party found looming up before it the streaked and many-colored Funeral Range of mountains. Nothing daunted, they laboriously toiled up to the crest with their teams. On looking down their hearts sank within them as they beheld a precipitous descent to a long, deep, and narrow valley almost destitute of vegetation. This depression was to be christened Death Valley.

It was now too late to turn back; so, unyoking the oxen,

they proceeded to lower the wagons down into the valley by hand, using chains and ropes. By the time they had finished the task darkness had shut down and, gathering sufficient greasewood brush to make a fire, they cooked their evening meal with a scanty supply of water and vainly searched for more. The food was eaten in gloomy silence, for they were lost and knew not where they were nor how to reach the nearest settlement.

It was apparent to all, however, that they must hasten to leave this kiln-dried desert valley as soon as possible. Abandoning their wagons and nearly all of the surviving oxen to their fate, after incredible hardships from lack of both food and water, about one-half of the company of thirty souls that crossed the Funeral Range reached the settlements alive. Succumbing to their sufferings, the others dropped, one by one, by the wayside unknelled and uncoffined. The skeletons of several of these unfortunate emigrants were found years afterward by exploring parties and prospectors.

Among those who escaped was a man named Bennett, who, on reaching the nearest town, reported that he had found a ledge of pure silver. The reputed discovery occurred in this way. As he was wending his course along one of the canyons he came across a spring, and, being both thirsty and tired, after taking a drink sat down to rest. While sitting there he carelessly broke off a piece of a rock jutting out near him, and perceiving that it was very heavy and thinking it might be of some value, placed a small part of it in his pocket.

After he had reached San Bernardino he happened to purchase a gun lacking a front sight. Bennett therefore sought a gunsmith, whom he requested to make a sight out of the metallic rock which he had found that he might have a souvenir which would not be easily lost.

To the astonishment of all who learned the facts, the

metal proved to be pure silver. This circumstance gave rise to the celebrated "Gunsight Lead," a phantom that was chased in every direction from Death Valley; but, like the mirage of the desert, the lead was never found.

In summer the valley is said to be the hottest place on the face of the earth, and persons deprived of water even for an hour become insane. Men who have attempted to cross it at mid-day have been known to fall dead, and birds flying across have been killed by the fierce heat.

Cloud-bursts occur occasionally on the adjoining mountains, when torrents pour down the declivities, filling the canyons with streams of water sometimes many feet deep, which sweep everything before them. A cloud-burst may change the whole face of the mountain. Cloud-bursts come usually in the hottest weather and almost with the suddenness of an explosion. A swiftly moving black cloud tipped with fiery streaks and growing rapidly appears above the crest of the mountains. Then it sinks like a monster balloon turned sidewise until it strikes a ridge or peak; the flood is then let loose and destruction follows.

Many stories are told of persons barely escaping with their lives by hastily climbing up the side of the canyons, beyond the reach of the roaring waters, and of others being overwhelmed and drowned. Such a flood, caused by a cloud-burst, may have buried the alleged Gunsight Lead and have changed the conformation of the canyon beyond recognition.

No one without experience in travelling over deserts in the summer season can realize the hardships attending travel in the region of Death Valley nor the sombre sameness of the arid stretches of sand. When the sun has set and the full moon rising makes the silhouettes of the mountains look darker, a vague, indescribable sensation comes over one—an awe-inspiring feeling of insignificance

and helplessness amidst scenes of majestic desolation. If religiously inclined, one is prone to utter the words of the wandering Arab of the Sahara, "Nothing exists here but Allah! *Allah hu Akbar!*—God is greater than all his created witnesses." In summer, the air being almost entirely destitute of moisture, evaporation is exceedingly rapid, and so hot is the sun at this season that metal objects lying out-of-doors burn the hand if touched.

Many years ago valuable borax deposits were discovered in the Death Valley and thousands of tons of borax have been freighted out by huge wagons drawn by mules; indeed, "twenty-mule-team borax" has become almost a household term. Borax is still mined here, but not so extensively as formerly, more accessible borax deposits having been found in Nevada and elsewhere—and the twenty-mule team is now a motor-truck!

Nearly one-third of all of the borax of the world comes from the deserts of California and Nevada. When borax was first discovered in California the wholesale price in New York was about fifty cents a pound; now it is about six cents.

The various applications of borax to industrial and domestic uses have kept pace with its enormous production during the last twenty-five years, until now it is used for more than fifty different purposes. The meat-packers of the United States alone use several million pounds as a preservative. It is also used with excellent results as an antiseptic in dressing wounds and sores.

Furnace Creek enters the valley on the eastern side of Death Valley, but its waters soon sink out of sight. The creek is used to irrigate a tract of alfalfa, a small garden, and a few trees; and the small ranch, a veritable oasis in a desert, is rightly called Greenland. A few men are kept employed here by the borax company. Now and then, how-

ever, the whole crowd, tiring of the extreme heat, desert in a body.

This region is now robbed of some of its terrors by the completion of the Tonopah and Tidewater Railroad, which touches Death Valley at the old Amargosa Borax Works.

CHAPTER VI

THE MINERAL WEALTH OF THE ANDES

At this period of the world's progress, when so many marvellous inventions are taking place, one can scarcely realize the intense interest that was awakened by the first discoveries made in the New World. So great was the excitement that the most improbable stories were readily believed.

There were fountains of perpetual youth, Amazonian warriors, mighty giants, and rivers whose beds sparkled with gems and golden pebbles. The reports of every returning adventurer, whatever had been his luck, were tinged with the marvellous. In fact, a world of romance was now open to all and the opportunities to achieve fame and fortune were numberless. The first in the field stood the best chance to win the choicest prizes. Stories that outrivalled the Arabian Nights clouded the realm of reason.

So extraordinary were the accounts that many of the cities of Spain were depleted of their most energetic men. Every craft that could sail the seas was called into use, and the building of new vessels was hastened to completion in order to provide for the needs of adventurous prospectors and would-be explorers.

The conquest of the Aztec Empire, with its millions of treasure, by Cortez had already proved the valiancy of Span-

ish cavaliers. To add to this, the conquest of the Incas by Pizarro and his followers was regarded a miracle of divine interposition.

As a result, Spanish galleons laden with treasure from the conquered countries ploughed the seas, and untold wealth poured into private and royal coffers. Spanish ambition and greed for gold knew no bounds. Cunning and cruelty were employed by the Spaniards to secure their ends. No trials, no hardships were too great for them to endure. No perils daunted them. Western South America, ruled by viceroys for nearly three centuries, brought to Spain its greatest wealth. One-fifth of all the wealth and treasure acquired was reserved for the crown.

When Pizarro first visited the interior of Peru he found an empire well advanced in the arts of civilization. Its temples within and without were richly decorated with gold. There were thousands of miles of excellent roads, of which two were used for military purposes. One of these extended along the lowlands; the other traversed the grand plateau. These roads crossed ravines bridged with solid masonry and were pierced by tunnels cut through solid rock. The construction of these great roads was a more wonderful achievement than the building of the Egyptian pyramids.

The government was systematically organized and to a certain extent it was both paternal and communal. Agriculture was skilfully carried on by means of fertilization and irrigation.

The sun was the chief deity and object of worship of its people. Their most beautifully adorned and renowned sanctuary was the Temple of the Sun at Cuzco. Besides this sacred edifice there were several hundred inferior temples and places of worship scattered through the empire, all plentifully ornamented with gold and silver. Every Inca

ruler was regarded as a descendant of the sun and therefore a sacred person.

According to the popular belief, gold consisted of tears wept by the sun and was therefore a sacred metal suitable for beautifying the palaces of the Incas and temples of worship. Not only were the edifices themselves richly adorned with this precious metal, but the sacred vessels and many of the articles of furniture were made of the same material. Silver, also, was much used, but was not considered sacred. So great was the amount of the precious metals used that each royal palace and temple was a veritable mine.

From 1520 to 1525 reports of a rich empire at the south were circulated among the adventurers congregated at Panama. At length they were confirmed in a great measure by travellers who had voyaged southward along the coast. Francisco Pizarro, a restless spirit who had been associated with Balboa and others in discovery and exploration, determining to test the truth of these reports, made several voyages south.

Finally, he landed on the shores of Peru with an army of followers who numbered less than two hundred. He met with but little opposition from the natives while marching toward the interior, and although he plundered some of the places through which he passed, the people received him with marks of friendship.

In some instances towns of several thousand population were deserted on the approach of the Spaniards, so great was the terror inspired by the white men, especially by those on horseback. At first it was the policy of the invaders to treat the natives with kindness in order to accomplish their purpose, namely, to conquer the Peruvian Empire in the same manner that Cortez had conquered the Aztecs. They were accompanied by two of the natives who previously

had been taken to Spain and taught the Spanish language. By this means the Spaniards were able to communicate with the people.

Learning that the Inca ruler, Atahuallpa, was encamped with his army among the mountains, Pizarro sent an embassy to request a meeting with him. It was agreed that they meet at Caxamalca, a strongly fortified city among the sierras. On arriving at the city, the Spaniards found it evacuated. Soon after taking up their quarters there, Atahuallpa arrived and established his camp a short distance outside the city.

Pizarro at once sent word to Atahuallpa to come into the city and sup with him, but asked that, in order to show his faith in the white men and his own good intentions, he should leave all weapons behind. After much persuasion Atahuallpa accepted the invitation and entered the city, with several thousand of his followers, unarmed.

When fairly within the enclosure, a priest approaching the Inca ruler made a harangue about Christianity and demanded that he should submit to the authority of the Spanish king.

"By what authority do you demand such submission?" replied the monarch with flashing eye.

"By this holy book which I hold in my hand," answered the priest.

Then snatching the volume from the hand of the priest, Atahuallpa scornfully threw it on the ground, saying, "What right have you in my country? I will call you and your companions to an account for the indignities heaped upon me."

Picking up the book, the priest forthwith went to Pizarro and reported the conduct of the Inca, saying, "It is useless to talk to this dog. At them at once; I absolve you."

Immediately Pizarro raised his handkerchief for the pre-

concerted signal, the firing of a gun. Thereupon his soldiers, infantry and cavalry, rushed from their places of concealment upon the defenceless Indians, slaughtering them unmercifully right and left.

The discharge of the arquebuses and cannon, with their smoke, and the charge of the cavalry paralyzed the unsuspecting natives, and the attack became a horrible massacre. Not until thousands of the Indians had been killed and the Inca ruler had been captured did darkness cause the Spaniards to desist from their bloody work. So sudden and terrible had been the onslaught that the haughty monarch himself seemed stunned by the effect.

Realizing the irresistible power of the white men with their wonderful weapons and horses, the natives gave up for a time all thoughts of resistance. In fact, they regarded the Spaniards as superior beings endowed with preternatural gifts.

When the ruler had been kept a prisoner several months, he desired to regain his freedom. By this time he realized the Spaniards' thirst for gold, and therefore promised to fill the room in which he was confined with it as high as he could reach, and twice to fill an adjoining room with silver, if they would release him.

Pizarro agreed to this proposal; Atahuallpa thereupon sent out messengers to all parts of his empire requesting that the metals in the shape of utensils and ornaments be collected from the royal palaces, temples, and elsewhere and brought to Caxamalca.

On account of the difficulty of transportation, since all the treasure had to be carried on the backs of the natives, many months elapsed before the collections could be made.

When fifteen and one-half million dollars' worth of gold and a large amount of silver had been delivered at Caxamalca, Pizarro excused the imprisoned ruler from further

contributions. At this juncture of affairs Almagro, a co-partner in the Peruvian expedition, arrived on the scene with a strong reinforcement.

On learning of the immense amount of gold and silver collected, the followers of both leaders loudly clamored for its distribution among them, and, taking out the royal fifth part, the remainder was divided according to the rank and service rendered. Then came rumors of an uprising among the natives and of the collection of an army to drive out the invaders, but on investigation these reports were found to be false.

The question then uppermost in the minds of the Spanish leaders was the disposition of the royal prisoner. It was thought that, were he released according to promise, the natives might rally around him and demand the expulsion of the intruders. So it was decided to make charges against him and to have at least the form of a trial in order to give an appearance of justice to the proceedings.

Twelve charges were made against Atahuallpa, nearly all of which were far-fetched and absolutely false. He was found guilty and condemned to death by burning; but at the last moment, when he was chained to a stake and the torch was ready to be applied, the priest in attendance promised that the sentence should be commuted to the easier death by the garrote if he would renounce his idolatry and embrace Christianity. He assented to the proposal, and immediately the modified sentence was carried out. It is not necessary to add that the execution of the Peruvian monarch was the darkest stain on the pages of Spanish colonial history. From this time on the conduct of the Spanish invaders was marked by a most inhuman cruelty toward the natives.

Thinking that he could more easily govern the empire through a native ruler subservient to himself, Pizarro placed

The Oroya Railroad, Peru, showing four sections of the road

Manco, the true heir, on the Peruvian throne. In the meantime, however, parts of the empire rebelled against the new ruler and the Spanish usurpers. Then, when the rebellious tribes had been brought back to their former allegiance, the Spanish leaders quarrelled and fought among themselves.

It was not long before the arrogant and cruel conduct of the Spaniards alienated all friendship on the part of both ruler and his subjects. Manco broke from his masters and, aided by his people, raised the standard of rebellion, determining to make a last supreme effort to rid his subjects of the incubus that was sapping the life of the country.

After many bloody encounters in which both sides sustained severe losses, Manco was killed and the Spanish yoke was firmly fixed on the neck of the people, who for the greater part were consigned to a most inhuman slavery. Thousands perished by the brutal treatment inflicted upon them in the silver mines.

In the course of time Indian slavery was abolished in a great measure by royal proclamation; nevertheless, Spain continued to rule this land for three hundred years before the oppressive yoke was cast off by a successful uprising. It is a pleasure to know that many of the Spanish leaders who were guilty of this heartless cruelty suffered violent deaths in quarrels among themselves or in rebellion against the crown of Spain.

During the period of Spanish rule an immense revenue accrued from working the rich silver mines. Those that filled the Spanish treasure ships so eagerly sought by buccaneers were the mines of Potosi. These silver lodes, extensively worked through Indian slave labor by Hernando and Gonzalo Pizarro, brothers of Francisco Pizarro, were discovered in 1546.

So rich did the lodes prove to be that the city of Potosi sprang up near them and was supported by them, although

the site was far from being desirable. Its altitude is about thirteen thousand feet, and it is, therefore, the highest city in the world. It is situated on the bleak side of the Andes, from whose snow-clad peaks cold, piercing winds sweep down over the city. Towering above it is a mountain, honey-combed with shafts, tunnels, and drifts, from which has been taken silver to the value of two billion dollars.

At first it was thought that a location so high above sea level would be unhabitable, but the immense wealth of the silver lodes required many workmen for their development, and these laborers had to be housed and fed.

At the zenith of its prosperity Potosi possessed one hundred seventy thousand inhabitants, and had the distinction of being the largest city in the New World during the first two centuries of its existence. A mint built in 1562, at the expense of over a million dollars, is long since unused. A splendid granite cathedral ornamented with beautiful statuary still attests to the former grandeur of the city.

Some of the richest veins of silver ore in the Potosi mines have been worked out and many mines have been allowed to become filled with water. These conditions, coupled with the low price of silver for many years, have caused the population of the city to dwindle until now there are scarcely more than ten thousand inhabitants and very many of the buildings are in ruins. These mines have produced twenty-seven thousand tons of silver since their discovery, and at the present day many of them are yielding large returns.

The Bolivian plateau is one vast mineral bed abounding in rich mines of copper, tin, silver, and gold. In Bolivia alone there are upward of two thousand silver mines; while some of the richest tin mines in the world are found here. Lodes of pure tin several feet in width have been followed down six hundred feet. Tin mines were recently discovered among the mountains thirteen thousand five

hundred feet above the level of the sea, near the shores of Lake Titicaca.

Two railroads now reach this high plateau, one from the seaport town of Antofagasta, Chile, to Oruro, Bolivia; the other from Molendo, Peru, to Puno, on Lake Titicaca. The most wonderful railroad in the world and the most costly in its construction, the Oroya Railroad is about one hundred fifty miles long. It begins at Callao, Peru, and ends at Oroya. The highest point reached by it in crossing the Andes is fifteen thousand six hundred and sixty-five feet. It is said that seven thousand lives were lost in its construction. Much of the road-bed was blasted through solid rock on the sides of the mountains. The cost of construction was about three hundred thousand dollars per mile. It has seventy-eight tunnels, the longest being the Gallera tunnel, which pierces Mount Meiggs at the altitude of fifteen thousand six hundred and sixty-five feet. This is the highest place in the world where steam is used as a motive power. Ultimately the road is to be extended to the celebrated mines of Cerro de Pasco, fifty-one miles beyond its present terminus, Oroya.

The chief business of these railroads extending into the Andes is carrying ore, bullion, and wool. Their construction marks the acme of engineering skill; the scenery along them surpasses that of all other regions in its wild ruggedness, grandeur, and sublimity.

In ascending to such great heights quickly one not accustomed to high elevations is apt to experience dizziness, headache, and nausea. At first even the effort to talk on reaching these lofty places by train is laborious. Dogs taken from the lowlands to these elevations are unable to run with speed for a long time, but those which are born and reared in this region easily pursue wild animals.

When the New World was discovered the llama was the

only animal used there as a beast of burden. Thousands of these diminutive creatures are still used for transporting ore and bullion in the Andes. Each animal can carry a load of seventy-five pounds or more. This sure-footed animal can travel with its load about fourteen miles a day.

Lake Titicaca is one of the famous lakes of the world. Its name means tin-stone and was doubtless derived from

Llamas resting

the tin ore found in the vicinity. The lake has an elevation of twelve thousand five hundred and fifty feet, and although nine streams run into it, only one, the Desaguadero, flows out, carrying its waters to Lake Poopo, a small body of salt water nearly three hundred miles south. Lake Titicaca has the same surface level both summer and winter. The outflow never reaches the sea; it is lost by evaporation mainly in Lake Poopo, but the latter frequently overflows into the salt marshes lying to the southward.

Though thin ice may be found in the quiet bays and inlets nearly every morning during the year, the expanse of the lake is never frozen even in the severest weather. A peculiarity about the lake is that not only will iron not rust when left in its waters, but that which was before rusted soon loses its scales of rust after being immersed a few days.

Several steamers ply on the lake carrying chiefly ore and wool. Some of the islands in the lake are inhabited by Indians who eke out a precarious living.

A civilization antedating that of the Incas formerly occupied the region about the lake, as is proved by the remarkable ruins along the shores concerning which the natives told the early Spaniards that they had no record. Three square miles are covered by these ruins, whose walls were made of immense blocks of stone most accurately fitted together, thus giving evidence of the great skill in stone-cutting possessed by the pre-Inca people.

The Inca rulers had beautiful palaces and other edifices on some of the islands. Titicaca Island was regarded as sacred, and at the time of the Spanish conquest was the site of a large temple richly ornamented with gold and silver.

Prospecting in the Andes is attended with great hardships. Few wild animals can be found to furnish food. Food and utensils must be carried on the backs of men, and the greatest difficulty is experienced in traversing the almost inaccessible steeps and deep ravines.

Coal of inferior quality has been found near the shores of Lake Titicaca and is used by the steamers sailing on its waters. Many rich mineral lodes yet remain undiscovered, and a vast number of valuable mines languish for lack of capital to develop them. Frequent revolutions and the insecurity of private property prevent the investment of foreign capital.

The Andes will continue to be a great storehouse of minerals for many years to come.

Muffling the feet of the Peruvian Andes is a long narrow strip—drifting dunes of rock waste—known as the Atacama Desert. In comparison with this awful desert, the Sahara is said to be a botanical garden. Here during

Silver-smelting works at Cassapalca, on the Oroya Railroad, Peru, 13,600 feet high

a part of the year a fierce, relentless sun pours down its burning rays on the shifting sands, keeping the air at a scorching heat both day and night. Formerly the region belonged to Bolivia, but it was annexed to Chile as a result of the war of 1881.

For miles and miles not a blade of grass, not a tree, not a shrub is to be seen. All around is a bleak, barren waste destitute of water. Yet underneath these sands

lie concealed immense deposits of "nitrates" of untold wealth.

Although small quantities of the nitrates had been sent to Europe for chemical purposes—chiefly the manufacture of gunpowder—no considerable amount was exported until a fortuitous discovery was made by a Scotchman named George Smith. After wandering over the world for some time Smith settled down in a little village near Iquique, where he had a small garden containing fruit-trees and flowers. In one part of his garden he noticed that the plants grew best where the soil contained a white substance.

He then proceeded to gather a quantity of the material and to experiment with it. To his surprise he found that a mere handful of it greatly stimulated the growth of plants. He told a member of his family in Scotland who was engaged in fruit-growing about the wonderful effects of the material as a fertilizer. As a result several bags of nitrates were distributed among Scottish farmers and fruit-growers. So satisfactory did the fertilizer prove that an immediate call was made for more of it. Thus began a business which now yields the owners of the beds one hundred million dollars yearly.

It was soon found out that the nitrate in its raw state contained properties that were injurious to plants and that these should be first eliminated. Forthwith reduction works were established to extract the deleterious substances. These substances were mainly iodine and bromine, two chemical elements that are of greater value than the nitrates themselves. Within a few years railroads were built to transport the nitrates from the beds to the various ports where the reduction factories were erected.

Many men who had large interests in the nitrate beds became immensely wealthy in a short time. The great

value of the deposits caused towns and cities to spring up along the coast in the most inhospitable places, to some of which water was piped a distance of more than two hundred miles and at the cost of many millions of dollars.

The principal nitrate beds are in a shallow valley, four or five thousand feet above sea level, lying between a long range of hills and the base of the Andes. Just how these mineral deposits were formed it is difficult to explain, the most plausible theory being that this desert was once the bottom of an inland sea having vast quantities of sea-weed covered with sand. In the gradual decay of this substance the nitrate of soda, or "Chile saltpetre," was formed.

To obtain the nitrates it is necessary first to remove the top layer of sand and then a layer of clay. Underneath this is found a layer of soft, whitish material called "nitrate." The crude nitrate is sent to the nitrate ports to be crushed and boiled in sea-water. After boiling, the solution is drawn off into shallow vessels and exposed to the heat of the sun to evaporate.

When nearly all has been evaporated and the remaining liquid drawn off, the bottom and sides of the vessels are found to be covered with sparkling white crystals. This is the saltpetre of commerce, the highest grade of which is used in the manufacture of gunpowder, the second grade for chemical purposes, and the third grade, the great bulk, for fertilizing the exhausted soils of Europe.

The liquid drawn off is crystallized by chemical treatment and further evaporation, and from it is obtained iodine, an ounce of which is worth as much as one hundred pounds of saltpetre. From eighty to one hundred million dollars' worth of these nitrates are dug out and sold each year. Great Britain takes about one-third of the entire product and Germany one-fifth.

Iquique has the largest shipping trade. From this port about fifty million dollars' worth of nitrates and three million dollars' worth of iodine are exported yearly.

CHAPTER VII

THE CZAR'S GREATER DOMAIN

No other parts of the globe have been subject to so many kaleidoscopic changes by migrations during the past eight centuries as northern Asia and eastern Europe. In comparison both India and China have remained stable for many centuries.

Before the Christian era, Mongol tribes of northeastern Asia began their westward march, tarrying a few centuries along the way in the most fertile places and gathering force by multiplication until the thirteenth century. Then like a mighty flood they poured into eastern Europe, carrying everywhere in their pathway subjugation, devastation, and slaughter. During the early part of these migrations, the great Roman Empire trembled as she beheld the irresistible moving hosts, and her downfall was hastened by the ponderous blows dealt her by these barbarians.

In the early part of the thirteenth century, after the Mongol ruler Genghis Khan had overrun southern Russia, he turned northward and captured the cities of Moscow, Vladimir, and Ryazan, putting to death many of the inhabitants by the most fiendish methods of torture. Thousands were slaughtered merely to wreak vengeance for the strong resistance offered by the besieged before surrendering. Hundreds of thousands of the Russians both high and low were made slaves. Wives of the nobles who had been richly clad and adorned with jewels became servants of their conquerors.

In 1272 most of the Tartars became Muhammadans and henceforth became more intolerant of the Christians, thousands of whom they burned alive or tortured. This oppressive yoke was borne for nearly three hundred years. Then Ivan III succeeded in breaking the Tartar rule for-

Fishing for sturgeon through the ice of the Ural River. Catching the material for caviare

ever. Mongol tribes, however, remained a disturbing element on the border for two hundred years thereafter.

In the early part of the fourteenth century Othman, a Mongol, founded the Ottoman empire, which then consisted of only the western part of Asia Minor. His son and successor conquered Gallipoli in 1354, thereby gaining a foothold in Europe, and during the next two centuries successive Turkish rulers made large additions to the em-

pire until it embraced vast areas in Europe, Asia, and Africa. For a time, indeed, it threatened to absorb all Christendom. Adrianople was conquered in 1361 and made the capital of the Turkish Empire. Then, in 1453, after a memorable siege, Constantinople was captured by the Muhammadans, and made the capital of the empire.

Orkhan was the first to exact as tribute the strongest and healthiest male children of all Christian peoples whom he conquered. These youths, reared as Muhammadans and trained under strict military discipline, became that efficient body of troops called the Janizaries. For a long time they were the bulwark of the empire, but at length they became so dictatorial and powerful that the sultan began to fear them more than he feared his foreign enemies. In 1825, when the army was reorganized on the European plan, the Janizaries broke out in open revolt. Then the reigning sultan unfurled the flag of the Prophet and called upon the faithful to suppress the rebellious corps. In the contest that ensued it is estimated that twenty-five thousand of the rebels were put to death, twenty thousand were banished, and the others disbanded. This was the end of an epoch of blood-shedding and the beginning of an era of commerce.

The Russians have always been noted for their love of furs; as a result a small, fur-bearing animal, the sable, led to the conquest of that vast realm now known as Siberia.

About the middle of the sixteenth century a rich Russian merchant named Strogonoff, residing at Kazan, established salt works on the banks of the Kama, a tributary of the Volga River, and began trading with the natives. One day, having noticed some strangely dressed travellers and learning that they came from a country beyond the Ural Mountains, called Sibir, he despatched some of his agents into that land. On returning, the employees brought with

them the finest sable skins that the merchant had ever seen. They had been secured for a trifling sum.

Strogonoff began at once to extend the area of his trafficking, and informed the government of the lucrative commerce that he had opened up. Valuable concessions were then granted him. A few years afterward a Cossack officer named Yermak, who had been declared an outlaw by Ivan the Terrible, gathered together a force of less than one thousand men. The band was composed of adventurers, freebooters, and criminals, and the expedition was armed and provisioned by Strogonoff, who expected to profit by opening up the new region. Permission having been obtained from the government, in 1579 Yermak set forth with his followers for the unknown country.

So great were the impediments which the pathless swamps and forest offered, together with the severity of the climate and hostility of the natives, that his force was reduced by death, sickness, and desertion to the number of five hundred when he lined up his men before the large army of the powerful Kutchum Khan. Like Cortez and Pizarro, Yermak had unbounded confidence in his ability to cope with his enemies, who were rudely armed with bows and arrows, regardless of their numbers; for his own men were supplied with matchlocks, and with these—in the language of the natives —they could manufacture thunder and lightning.

A terrible battle ensued, and for some time success seemed evenly balanced. At length the fierce attacks of the Cossacks forced the barbarous hordes to give way and the retreat became a stampede. Kutchum Khan's camp and all its treasures fell into the hands of the conquerors. Yermak at once sent part of his force to occupy the Tartar capital, which was found to be evacuated, so great was the terror inspired by the Russians.

The success achieved by the handful of Cossacks led

several neighboring tribes to offer voluntarily an annual tribute of sable skins. When Yermak had collected several thousand of these skins, he sent a special envoy to Moscow to present them along with the conquered country to the czar. So greatly pleased was Ivan with the offerings that he forgave Yermak for his past ill deeds and made him governor and commander-in-chief of all the countries which he might conquer. Then, knowing that it would be difficult for the Cossacks to hold the conquered territory very long with their diminished numbers, the czar forthwith sent reinforcements.

Soon after the arrival of the additional troops, Yermak audaciously started out to make further conquests. One dark and rainy night he encamped with his force on a small island in the Irtish River. Relying on the terror which his name had inspired, and the stormy weather, he deemed it unnecessary to post sentinels. Wearied with their long march, soon all of the Russians were buried in slumber.

But Kutchum, smarting under his humiliating defeat, had spies constantly watching his foes, intending, if possible, to take them by surprise. When the spies reported to him the lack of vigilance on the part of the enemy, he stealthily crossed to the island with his force and fell upon the sleeping camp. All the Russians but two were killed, and these, escaping, reported the disaster at Sibir. When Yermak saw the annihilation of his troops, he cut his way through the Tartars and attempted to swim the stream, but was dragged to the bottom by his heavy armor and drowned.

When news of the crushing disaster reached Sibir the Russians, losing heart at the death of their leader, evacuated the place and returned home. The czar, nevertheless, had no idea of permitting a land so promising to slip

from his grasp. It was not long before he sent a larger army across the Ural Mountains, which not only reconquered the lost territory but also the rest of western Siberia.

Gradually the Cossacks moved eastward, conquering tribe after tribe. As they advanced they built strong wooden forts by which to hold their vantage ground. Tomsk was founded in 1604; by 1630 the tide of conquest had reached

Gathering salt at the mouth of the Ural River

the banks of the Lena; and within eighty years from their first conquest the Russians had reached the Pacific.

Years afterward a suitable monument was erected to Yermak in the city of Tobolsk, which was built on the battle-field where he gained his first decisive victory over the Tartar ruler. His real monument is all Siberia, whose conquest he inaugurated.

In 1847 the Amur River section was annexed by Russia regardless of the protests of the Chinese Government. Quarrels ensued over the boundaries and, finding resistance hopeless, the Chinese ceded to Russia all the land on

the left bank of the Amur as far as the mouth of the Ussuri and on both its banks below that river.

The sable gradually led the Russian hunters to Kamtchatka, while the more valuable sea-otter beckoned them across the sea to the Aleutian Islands and that part of the American continent now Alaska Territory. The chief incentive in all of these conquests was the securing of valuable furs. The sable is even yet found along the streams in both open and forested sections from the Ural Mountains to the Pacific; but so relentless has been the pursuit of this valuable fur-bearing animal that it is now nearly exterminated. Besides the sable and the sea-otter, there are found in Siberia the ermine, bear, arctic fox, common fox, deer, wolf, antelope, elk, hare, and squirrel.

To avoid entering into conflict with the more powerful people at the south, the Russians chose to advance eastward along higher latitudes toward the Pacific. But within a few years after the Muscovite empire had acquired central and northern Siberia, there were loud complaints that the tribes on the south were making raids on them, robbing them of their property and carrying their people into slavery. So, from time to time, Cossack forces were sent to chastise the offenders; and in many instances they were punished and their territories were annexed to Siberia.

In these raids the Turkomans were the most active. During the forty years previous to 1878 it is estimated that eighty thousand Russian subjects and two hundred thousand Persians were made captives and sold into slavery. In 1873 the Russians captured Khiva and liberated thirty thousand Persian slaves.

Notwithstanding these lessons, some of the Turkoman tribes still went on marauding expeditions, robbing, killing, and enslaving their neighbors. So, in 1878, another strong force of the Cossacks was sent against the pillaging tribes,

who were made to release all slaves and abolish slavery. Little by little all Turkistan became Russian territory. Bokhara and Khiva alone keep their old forms of government, but they are practically Russian states and pay Russia annually a stipulated tribute.

It is thought that once upon a time Siberia had a much larger population than it has now and the peoples who lived there dwelt farther north. The first colonists lived in the stone age and were contemporaneous with the mammoth, whose remains are found scattered all over the northern part of Siberia and the adjacent islands.

In the interior these remains are found imbedded in thick strata of pure blue ice, which is covered by the river gravels of streams that do not now exist. So thick are these layers of ice that they may be likened to the rocks found in lower latitudes. Several of these animals have been found imbedded in the ice in an almost perfect state of preservation, and quantities of their tusks are obtained annually along the northern rivers where the spring freshets have worn away the banks of the streams.

Whenever the ivory-tusk hunter sees the end of a tusk sticking out of the river bank, he is soon able to remove it from its resting place with pick and shovel. Great quantities of this fossil ivory are also obtained from the islands to the north of the mainland.

As in arctic America, the ground of northern Siberia is frozen solid to the depth of many feet, and even during the hottest summer it thaws down only a few inches. The climate is continental in character, being marked by fierce winds and great extremes both in temperature and moisture. In midsummer the temperature may reach one hundred and ten degrees, while in midwinter it has been known to reach ninety degrees below zero.

Roughly speaking, Siberia may be divided into three

longitudinal belts: first, the tundra, which borders the Arctic Ocean and extends several hundred miles south of it; second, the forest belt, several hundred miles wide, which extends across the continent; third, the southern part, consisting of desert steppes, swamps, grassy plains, and a few broken forests.

The tundra is a vast lowland plain which in winter is a desolate, frozen waste, and in summer a vast swamp of lichens and arctic moss. Here nature is embalmed in eternal frost, and life is a terror-inspiring struggle with cold and hunger.

In spring, when the snow is gone and the ground begins to thaw, thousands of geese, ducks, swans, and other feathered creatures appear, enlivening the monotonous scene for a few months; then, when the sharp September frosts announce the approach of winter, with their tundra-reared progeny they wing their way southward, leaving the icy plains to the wandering fox and the arctic owl.

One writer speaks of the tundra as the very grave of nature, the sepulchre of the primeval world, because it is the tomb of so many animals whose remains have been protected from putrefaction for thousands of years. How interesting would it be could these animals be brought to life and be endowed with sufficient intelligence to relate the history of their age and generation!

The reindeer in the valley of the Lena spend the winter near the forests, but as the spring advances they migrate to the thousands of islands in the delta to escape the heat and mosquitoes farther south. To reach their destination they are obliged to swim across broad channels of water. The animals have special places for crossing, and on their return south the natives station themselves at these places and slaughter them in large numbers.

All the swamps and marshes throughout Siberia are the

breeding places of innumerable mosquitoes, which in summer fly over the country in such dense clouds as to render life in certain sections almost unbearable.

Just north of Mongolia where the Yenisei River enters Russian territory is the wonderfully interesting fertile prairie region of Minusinsk. Being well watered and sheltered on all sides by mountains, it is one of the most fertile spots in all Siberia. Here the disintegration of gold-

Driving over the tundra in winter

bearing rocks has formed large mining fields which are profitably worked. In the vicinity are also valuable iron mines, which were opened early in the prehistoric period, and which are still worked.

Because of its delightful climate and special attractions for the archæologist, this charming section is called the "Italy of Siberia." There have been obtained from the mounds found in this section many thousand relics relating to prehistoric man which exemplify his progress from the stone age through the bronze to the iron age. This fine collection of upward of sixty thousand different ar-

ticles is housed in an imposing and substantial museum erected in the town of Minusinsk. This building contains the richest collection of implements representing the bronze age in the world.

The forest belt is so immense that the wooded plains of the Amazon shrink into comparative insignificance. For the most part these great forests are composed of evergreen trees, the fir, pine, larch, and pitch-pine predominating. In many localities there are hundreds of square miles of perfectly straight pine trees of great height, where neither man nor beast could find the way out. Even experienced trappers dare not enter these forests without blazing trees along their pathway, so that they may be able to extricate themselves by retracing their steps. In these huge evergreen solitudes there is an inexhaustible supply of the finest timber in the world. In every sense of the word they are solitudes; for one may travel scores of miles without meeting or hearing either bird or beast.

At the conclusion of the war between Japan and Russia it was stipulated that Russia should cede to Japan the southern part of Sakhalin Island. The cession was made in 1905. During the following two years a large number of Russians and Japanese were employed in marking the boundary, by cutting through the forest from east to west a strip one hundred miles long and twelve miles wide. The fir forests of the Japanese portion, covering more than three million acres, are alone estimated to be worth forty-five million dollars, to say nothing about the extensive coal deposits and the large areas of land available for tillage.

Of the native peoples of northern Siberia the Yakuts are the most numerous. They resemble both the Eskimos and the Lapps. They occupy several valleys, including that of the Lena River and a strip along the Arctic Ocean to the west. So inured to cold are these people, that where the

temperature ranges from ninety degrees below zero to ninety-three degrees above, the adults wear light clothing in the depth of winter and the children sport naked in the snow.

The desert zone includes a vast region east of the Caspian Sea and extends to the Tian Shan Mountains, which separate it from the desert of Gobi. Here, as in the Mohave Desert, are found the leafless, thickly spined forms of the cactus family.

A product peculiar to Siberia and highly appreciated by the inhabitants on account of its edible qualities is the cedar nut found in all of the northern forest region. So great is the demand for these nuts that in Tomsk alone thousands of tons are sold each year. They resemble pine nuts. A gum called larch-tree sulphur, chewed by both natives and settlers, is also obtained from these forests. Bee-keeping, especially in eastern Siberia, is an important industry which has been followed from remotest ages. The annual yield of honey is estimated to be upward of three million pounds.

The camel is usually associated with the hot desert regions of the Sahara and Arabia, yet in Siberia immense numbers of camels are used. It is not an uncommon sight to see them in midwinter hauling sledges along frozen roads and ice-covered rivers.

The richest gold fields are in the swamp and forest sections of central Siberia and in the Ural and Altai Mountains, although the metal is widely scattered all the way from the Ural Mountains to the Pacific. The word Altai means gold. The world's supply of platinum virtually comes from the gold-mines of Siberia as a by-product. In many parts of the mining region, as in Alaska, the frozen ground must be thawed by fires before it can be worked.

The building of the Trans-Siberian Railroad has wrought a wonderful transformation in Siberia by giving a great impetus to agriculture and other kinds of business. This

great achievement, begun in 1891, was practically completed in eleven years, at a cost of one hundred and seventy-five million dollars. Subsequent work, together with equipment, double tracking, and the building of additional lines, has doubled the first cost.

The eastern terminus of the main line is Vladivostock; a branch line across Manchuria reaches Port Arthur and Dalny, or Tairen, as it is now called. The continuous railway route from St. Petersburg to Port Arthur is five thousand six hundred and twenty miles, four thousand five hundred miles of which is in Siberia. The first rails used, proving too light for the tremendous traffic, were replaced with heavier ones, and the road-bed itself has been widened and strengthened.

The fare on the road is very reasonable. For long distances it ranges from about a cent per mile to less than half that rate, accordingly as one travels first, second, third, or fourth class. Riding first class one can secure sleeping accommodations equal to the best that one finds on the roads of the United States, and in addition one may have the luxury of a bath.

Since the completion of the road the government has done everything possible to attract Russian emigration from Europe in order to settle and develop the country. The consumer in Russia becomes a producer in Siberia. The number of Russian emigrants who have settled along the line during the past five years will average one hundred and fifty thousand annually.

To start the Russian farmers in these new regions the government gives each man of family a certain amount of money or an equivalent in stock and tools; and in addition loans him small amounts at a low rate of interest, to be repaid in five years, with a proviso that if there be bad crops the time will be extended. For the year 1908, nine million

five hundred thousand dollars was set aside to assist the peasant farmers.

Following in the wake of the completion of the Trans-siberian Railroad, additional steamers have been placed on all the large rivers to meet the growing demands of commerce. Hundreds of steamers ply upon the rivers during

Train on the steppes of Russia

the open season, but no vessels attempt the route by way of the Arctic Ocean on account of the long distance and frequent ice obstructions.

Dairying, now a most important industry of Siberia, was unknown before the advent of the great railway. To promote this industry, the government has already expended more than a million dollars. At all the principal places schools have been established in which the best methods of dairy-farming are taught. Fortunately, cattle diseases are practically unknown.

The fine quality of the grasses, together with the improved methods of manufacturing brought about by the creameries,

causes Siberian butter to rank with the best products found in the European markets. The dairy products are shipped by rail to various parts of Europe, large quantities going to England and to Denmark, the home of dairying. Sometimes three hundred tons of butter per week are shipped to Copenhagen and one thousand tons to London. Upward of eighty million pounds are annually exported, and it is said that by a little exertion fifteen times the amount could be easily produced. The industry is still only in its infancy.

In the Tobol and Ishim plains of western Siberia are the fertile black-earth regions covering twenty-five million acres. As yet, they are sparsely settled, but they are capable of supporting half the population of Russia. Two-thirds of the inhabitants of Siberia are Russians, and in timbered regions probably one-half live in log houses, for these are capable of being made the most comfortable dwellings in the world.

Many exaggerated statements have appeared, both in England and America, concerning the exile system. This, happily, is now abolished, as also have been the cruelties practised by those in charge. That there have been great abuses no one denies, but the conditions of the prisons can be paralleled both in England and the United States. No more common criminals are sent to Siberia.

Transportation is now limited chiefly to escaped convicts and to political and religious criminals, most of whom are sent to the island of Sakhalin. Capital punishment, except in cases of attacks on the royal family and condemnation by courts-martial, was abolished many years ago.

Lake Baikal is one of the most remarkable lakes in the world. It is four hundred miles long and from twenty to sixty miles wide. The lake is very deep, and, although situated in the temperate zone, is the home of a species of arctic seal and tropical coral. This species of seal is found

nowhere in Asian waters outside of the Arctic Ocean, except in this lake and the Caspian Sea. Immense quantities of salmon of different species abound in the lake, and give rise to important fishing industries.

In winter the lake is covered with ice seven feet thick. Crossing is made by huge ice-breaking ferryboats capable of carrying thirty cars and one thousand men, yet only during a part of the winter is the boat able to navigate, so persistent is the extreme cold. The railway now extends around the southern part of the lake, and crossing by ferryboats is not attempted when the ice is thick.

Asiatic Russia includes Transcaucasia, which was permanently annexed to the Russian Empire in 1801. This great Asiatic domain contains more than six million square miles, or about twice the size of the United States, including Alaska.

Notwithstanding the millions of square miles of arid deserts, irredeemable swamps, frozen tundra, and impenetrable forests, the agricultural and mineral resources of Siberia are almost beyond computation.

CHAPTER VIII

THE MYSTIC HIGHLANDS OF ASIA

THE statement that "one half the world does not know how the other half lives, nor how it is influenced," applies with double force to the peoples living on the high plateau of Tibet beyond the titanic Himalayas. Here is a vast region only one-twentieth of which is covered with vegetation. Chains of mountains with snow-capped peaks encircle it, and spurs from the main ranges, together with lesser ridges and isolated elevations, diversify its surface.

Amidst these desolate wastes are fertile valleys which are capable of producing excellent crops; in many other sections good crops are produced by very primitive methods of irrigation. As a whole the plateau may be classed among the infertile regions of the earth.

On account of its great elevation, Tibet is often called the roof of the world. Starting from its borders several large rivers break through its rocky ramparts, among them the Indus, Brahmaputra, Irawadi, and Hoang. Some of the plains of the great plateau range from fifteen to eighteen thousand feet above sea-level. Scattered over these are single lakes and chains of lakes, many of which are salt. These vast areas, storm-swept in winter and baked by heat in summer, are frequented by bandits and nomads. They live in tents made of the almost black hair of the yak, and move from place to place with their flocks and herds to seek food for their animals. The stable population resides chiefly in the few cities and villages.

For nearly a thousand years a veil of religious mystery has shrouded this section of the world; and the sacred city of Lasa with its holy places has been doubly guarded against the visits of foreigners.

This mysterious land has been able to maintain its position of isolated seclusion because of the high mountain barriers that are massed in a series of gigantic walls on all sides. It is approachable only through narrow passes that are constantly guarded.

Our knowledge of the "forbidden land," as it is called, has been obtained chiefly from adventurers who have travelled through it in disguise, and from a few others who took more desperate chances by forcing their way in. Among these may be mentioned Bower, Thorald, the Littledales, Rockhill, Captain Deasy, Sven Hedin, and Walter Savage Landor. Landor was taken prisoner by the Tibetans and

Dunkar Spiti, Himalaya Mountains, India

suffered at their hands horrible tortures, from the effects of which he will never recover.

Because the Tibetans for many years had insulted the government of India and had seized territory claimed by it, English troops under Colonel Younghusband were sent against the invaders in 1903, and after several severe battles reached the forbidden city of Lasa, where a forced treaty was negotiated and signed. But on the withdrawal of the English troops the policy of exclusion was immediately resumed. Russia to-day has much greater influence in Tibet than has England.

The present condition of Tibet resembles in many respects that of Europe during the Middle Ages. The country is under the suzerainty of China, which has a representative called an amaban and several thousand troops at Lasa to maintain its claim.

Though an extremely trying climate prevails on these highlands, the hermit-like, priest-ridden people know no better home and are contented with their lot. Of its three and one-half million inhabitants, one in seven belongs to the priestly class called lamas.

At the head of this priesthood, as well as at the head of the state, are two leaders, the chief one, the Dalai Lama, or "ocean of learning," and the other the Bogodo Lama, or "precious teacher." With their subordinates, these two are supposed to have power not only over life and death, but over the reincarnation of the soul and entrance to the regions beyond rebirth.

This isolated table-land is the seat of a former Buddhism better known by the name of Lamaism. A deep but crude religious feeling tainted with the grossest superstitions pervades the whole people, whose ignorance of other learning is appalling.

When a person dies a lama must be present to see that the

soul is properly separated from the body and to direct the spirit on its journey to paradise; the lama must also influence its rebirth in a happy existence and provide for its entrance upon Nirvana, or eternal rest.

Many a mountain contains hollowed-out cells in which hermit monks spend their lives in silent meditation. On an island in one of the lakes, where they can be reached only when the lake freezes, reside twenty monks. In the midst of this wild and majestic scenery each rock and stream has its deity and saint, together with its appropriate legend.

Although the Buddhist monks do not believe in God as a creator, their religion demands audible and written prayers; indeed, prayer-wheels are frequently used to facilitate the repetition of prayers. Prayers numbering hundreds and even thousands are carefully written and placed, rolled up, in drum-wheels, which are revolved by wind, water, or hand power. Each revolution of a wheel is supposed to say all the prayers enclosed in it.

Many prayer-wheels, each with appropriate prayers, are mounted on axles and placed convenient to frequented paths so that they may be whirled around by those who pass by. Others provided with suitable fans are placed where they may be revolved by the wind. Sometimes water power is made to turn the wheels, but most of them are made of a size convenient to be carried about and operated by hand.

The capital of Tibet and seat of the Dalai Lama is Lasa, situated in a plain nearly twelve thousand feet above sea level. The city is surrounded by a marsh and is reached by a causeway raised above the morass. It has wide and regular streets, the principal buildings being made of stone, but the majority of the structures are adobe and sun-dried brick.

This interesting city contains forty-five thousand inhabitants, two-thirds of whom are monks. Streams formed by

the melting snow course down the surrounding mountains, flooding the plain. At a distance the city presents an imposing appearance with the adjacent Potala as the crowning glory.

In the centre of the city stands a cathedral, called the Jo-Kang, which contains one of the most renowned statues of Buddha. This image, of life size, is an object of the greatest reverence and adoration. It is made of a composition of metals, gold and silver predominating. Priests are always in attendance and lamps are constantly burning before it. The roof of the temple is gilded and the interior is richly furnished.

Situated in the suburbs, on a rocky elevation above the plain which overlooks the city, is a wonderful group of buildings forming the Potala, or palace of the Dalai Lama. This huge, conglomerate structure of granite rising story above story to an immense height fascinates the beholder, who marvels at the skill and patience of the builders.

As though to heighten its beauty, the Potala is separated from the city by a park of grass and trees about a mile wide, making the stately edifice look like a huge diamond encircled with emeralds. Nothing but a blind religious zeal could have brought to completion such a series of connected edifices with their miles of halls, courts, corridors, and labyrinthine passageways.

Scattered throughout Tibet are upward of three thousand monasteries, or lamaseries. Some of them are built in remote and inaccessible places and contain as many as seven thousand monks. Each lamasery has set apart for its use the best land in that vicinity, the cultivation of which is done by the common people, who are little better than serfs, or peons.

It is a notable fact that in this strange land there are many more men than women, although the reverse would be ex-

pected. The support of the hordes of lazy monks is a great incubus and retards the development of the country.

The use of water for cleansing purposes seems to be no part of the religion of the people; they never bathe their bodies and seldom wash the face and hands. To protect

The yak not only serves as a beast of burden, but furnishes milk, butter, and meat

themselves from the biting cold they smear their faces with rancid butter, which, catching the smoke and dust, adds to the effectiveness as well as the strength of the odor. Their homes and places of worship reek with dirt and filth; small-pox, ailments of the eyes, and other contagious diseases are prevalent. Harelip, in a great measure due to lack of proper nutrition, is a very common ailment.

In leather and inlaid work the Tibetans show great skill, much of the decorative work on the handles of their swords

and daggers being very artistic. The common people live in constant terror of evil spirits in this world and of terrible punishments in the hereafter; the educated classes believe they can drive off or propitiate all evil influences in this world, but fear they may be changed in a future rebirth to some vile form of being. In general, the people are treacherous and cowardly. For weapons of defence they use matchlocks; in firing them, the weapon is held directly in front of the nose.

Of domestic animals the yak is one of the most useful, since it not only serves as a beast of burden but furnishes rich milk, butter, and meat. The long hair of the animal is used for making ropes, tents, and cloth.

The yak resembles the ox in body, head, and legs; but it is covered with long, silky hair which hangs like the fleece of an Angora goat. The long, flowing hair of the tail reaches nearly to the ground. Thousands of these tails find their way to India where they are used for various household purposes.

Wild yaks are found in considerable numbers near the limits of perpetual snow, but at the approach of winter they descend to the wooded valleys just below the snow line. During the summer they pasture on the higher elevations. In their wild state yaks are fierce and dangerous. Being accustomed to high elevations, they fall sick and die when removed to the lowlands.

Milk is obtained not only from the yaks but from the sheep and goats. The sheep, being of large size, are frequently used to bear small loads. Many horses are raised, but they are used chiefly for riding.

Tibet is rich in gold, and for thousands of years the precious metal has been washed out of its surface by the crudest of methods. In fact, gold is washed from every river which has its sources in the Tibetan plateau. Most of it in time finds its way to China. Silver, copper, iron,

lead, and mercury abound in the southeastern part and considerable quantities are mined.

Traffic is carried on by means of caravans, the most common pack animal being the yak. Almost all the commerce is controlled by Chinese merchants, and the chief article of trade is tea, which is received in exchange for wool, hides, musk, amber, and gold. The tea is an inferior kind known as "brick tea," being composed of the refuse, stems, and leaves of the plants cemented with rice water and pressed into hard bricks. This kind of tea is preferred by the Tibetans, who brew it with butter and other ingredients and consume the entire concoction. The tea trade amounts to several million pounds annually.

CHAPTER IX

THE PRIMAL HOME OF THE SARACEN

WHO has not had the youthful imagination fired by the "Arabian Nights"? The simplicity and lifelike reality of these interesting stories, made even more fascinating by their Oriental color, appeal both to young and old.

So great has been their popularity that few works have been translated into so many different languages, while their influence on the literature of the present day is felt in a marked degree. They are more than the luxurious fancies of the Arab's mind, for they vividly set forth the love and hate, the craft and hypocrisy, the courage and revenge of his race. Moreover, they portray in a truly dramatic manner the innermost life and thought of the Moslem, while they captivate the senses by a magnificent panorama of exquisite banquets, lovely characters, charming gardens, and beautiful palaces.

The country and the descendants of the race that created these masterly storiettes are surely worthy of careful consideration. A region that is the birthplace of a religion claiming nearly two hundred million converts scattered all over the world must possess a special interest.

We are apt to look askance at everything Arabic as bordering on ignorance and savagery; but if we study the past of this alert race we shall find a profusion of historical side lights that are valuable; we shall also find in Arabic literature much to admire. The Arab is poetic and delights in imagery. There are Arabic poems dating back one thousand years before the Christian era that for beauty of thought, vigor, and polish are equal to those produced by any nation and in any age.

In the Middle Ages the Arabs led the world in commerce, exploration, art, science, and literature. The secret of their successful conquests was not in the number of their soldiers but in the courage inspired by the Muhammadan religion. Death has no terrors for the fanatical Moslem, for to him it is the vestibule of paradise where the pleasures of earth await those who fight in the holy cause.

By nature the Arab is active, vivacious, and keen-witted. He is proud of his lineage, earnest, and hospitable. The mother not only takes care of the home but educates the children; and, strange as it may seem to the outside world, illiteracy is practically unknown to Arabia.

To the Arabic race we are indebted for our knowledge of arithmetic, and many of the principles of algebra and geometry. The pendulum, the mariner's compass, and the manufacture of silk and cotton textiles were introduced into Europe by the Arabs. They claim to have used gunpowder as far back as the eleventh century. In the year 706 paper was made at Mecca and from there its manufacture spread all over the western world. To them we

Khaibar Pass, the gateway to India

owe many of the useful arts and practical inventions which were later brought to perfection by other nations.

Now, no one is quite certain about the Saracens as a people because the name has been very loosely used. It was applied by Roman soldiers to several wandering tribes of Arabs who were much accustomed to mistaking other people's flocks of sheep and herds of cattle for their own. Most likely there never was a Saracenic Empire. But there certainly was a time when Arabians controlled not only the Arabian peninsula, but also Syria and the fertile plains of the Tigris and Euphrates Rivers as well; and that great region became known as the "Land of the Saracens." From Damascus to Bagdad, and from the Bab-el-Mandeb to the Gulf of Oman, the Moslem was all-powerful.

Let us glance at the country itself. In the first place, Arabia is not a nation but a country made up of petty states—some independent, some controlled by the sultan of Turkey; two or three are included in the British Empire. But the country itself is very far removed from the rest of the world so far as accessibility is concerned; and although its coast is scarcely a gunshot from the greatest trade route of the East, Arabia is to-day one of the least-known countries in the world.

In general, the country is a moderately high table-land bordered by low coast plains. Much of it is an out-and-out desert; all of it is arid. Long ago it was divided into Arabia Petræa, Arabia Deserta, and Arabia Felix—that is, the rocky, the desert, and the happy. It is needless to say that Arabia the happy was the part receiving enough rainfall to produce foodstuffs.

The coast-line of this great peninsula is nearly as great as that of the Atlantic and Gulf coast of the United States; but in its entire extent, not far from four thousand miles, there is scarcely a harbor in which a good-sized fishing

schooner could find safe anchorage. Even at Aden a steamship cannot approach within a quarter of a mile of the shore. So one will not be far out of the way in designating Arabia as an impassable country with an impossible coast.

It is estimated that about seven millions of people live in the entire peninsula. To say that these belong to the Semitic race is merely to say that they are dark-skinned and black-haired. The Arab, whether a merchant dwelling in a city along the coast, or a Bedouin wandering with flocks and herds, is a product of the desert and of the teachings of Islam. His black eyes twinkle with shrewdness and he is a past master of craftiness. As a trader he is unsurpassed, and Arab traders control the interior commerce of western Asia and northern Africa just as the Chinese control the trade of southeastern Asia.

As a Bedouin of the desert the Arab is supreme in his way. Savage and blood-thirsty by nature, if there is no caravan to rob or common enemy to fight, neighboring tribes easily find cause for fighting one another. Usually a quarrel over pasture lands in the same locality furnishes an excuse for a feud that results in the extermination of one tribe or the other.

A hatred of those who are not followers of the prophet is a heritage of all Arabs. The merchant class, who are wealthy and usually educated, may have trained themselves to conceal it, but they possess it. Even to the most liberal Arab, one who is not of the faith of Islam is a "dog of an unbeliever." Among Bedouins, not to rob the caravan containing the belongings of a Christian would be a sin. There is one exception, however; if a Bedouin sheik agrees to convoy a party of "unbelievers," together with their valuables, over a robber-infested route, he will carry out his bargain faithfully.

Family ties among the Bedouin Arabs are much the same to-day as they were two thousand years ago. The great-grandfather, grandfather, or father, as the case may be, is the head of the family, and his will is law. The tribe is governed by a sheik, who is simply a "boss." He does not inherit his office, nor is he elected to it by popular vote; he elects himself because he is the best man, and he "holds over" for the same reason.

The family mansion of the Bedouin is a tent made of goat-hair cloth. Some tents occupy as much ground as is covered by a small cottage. The tent of a sheik may be richly furnished with rugs and silk portières; ordinarily, a coarse hearth-rug and a divan cover are about the only furnishings. The cooking utensils are primitive—one or two kettles to a family; and of tableware there is practically nothing more than one or two platters. Meat is freely eaten and coffee is commonly a part of each meal. In the place of bread, flour about as coarse as oatmeal is mixed to a paste, rolled or beaten into thin cakes, and cooked in hot butter. Dates are almost always a part of the food supply.

The camel has first place in the wealth of the Bedouin, but sheep and goats in many instances form a part of his herds. The tents of a family are pitched where the grazing is good and the families move about as they will. All disputes are settled by the sheik, and he is apt to emphasize his decisions by the free use of his lance shaft. Whenever it becomes necessary because of poor grazing, the whole clan or tribe may move to a distant place. All household goods are wrapped in packs or put into saddle bags. Two or three camels will readily carry the tent and luggage of a family. The women are carried in litters; the men ride camels. Horses are rarely ridden at such times.

If a caravan is to be plundered, however, the best horses

are used, and in addition to his lance the raider carries a heavy knife. Perhaps a few firearms may be carried, but they are generally either flintlocks or the older matchlocks. It is only within a few years that the modern rifle with metal cartridge has found favor with the Bedouin.

A group of Arabs with their dromedaries

The great Arabian peninsula, seemingly so far out of the world, produces many things, some of which the world cannot do well without. First of all, it is the home of the camel. Perhaps a more awkward and ungainly animal has not been domesticated, but certainly none is more useful. We are told by students of natural history that the camel is the descendant of the llama kind which seems to have originated in the South American Andes. Just how or when the descent from the New World, which is really the Old World, to the Old World, which is really the New World, was made we

are not informed; nevertheless, it looks as though the natural history student has the right end of the argument. After the animal got to Arabia it "developed." And while the result may not have been very artistic, no one will deny that it was good workmanship; for the world has never produced a more useful helper to mankind.

Practically all the riding animals are of the one-hump or Arabian species. They are much larger and stronger than the two-hump animals. One variety is slim and comparatively light in weight. These animals, as a rule, are trained to a swift gait, and are used solely as riding animals. They are called dromedaries, a word that means swift-runner.

Most of the other species are reared for the same purpose as domestic cattle. Some are valuable as beasts of burden, others are shorn for their coating, still others are kept for their milk and flesh. A well-trained dromedary will sell for three hundred dollars and upward; a pack animal rarely brings more than one-fourth as much. The milk of the camel is equal to that of the best domestic cows and is greatly prized. The hair of several species surpasses sheep's wool in texture and is used in the finer kinds of cloth, and it is the most precious textile in high-priced Oriental rugs and shawls. Ordinarily, however, camel's hair is coarse and is used for the cheapest textiles. Arabia is the source from which a large proportion of the camels used in the caravan trade of Asia and Africa is obtained. Fermented camel's milk is much used all over western Asia.

The Arabian horse has been famous in literature and in song for more than two thousand years. The district of Nejd has been the chief breeding locality for these horses for many centuries. Contrary to tradition, however, even the finest animals are neither so large nor so swift as American thoroughbred horses. The qualities that have made the Arabian horse famous are its beautiful proportions, endur-

ance, and intelligence. Young colts mingle freely with their owners and attendants, and they need, therefore, only the training to make them saddle-wise; they require no "breaking." Brought up with the family and treated with the greatest kindness from its birth the colt learns to regard his master as his best friend.

Ordinarily but little water is given them, and they are so well trained that a good animal will go a whole day in summer and two days in winter without drink. The pure, full-blood Arabian is never sold. It may be acquired only by gift, by capture in war, or by legacy. Animals of mixed breed, however, are freely sold, most of them going to Turkey and to India.

Mocha coffee is another product for which Arabia is renowned. The coffee berry bearing this name is of the pea-berry variety—that is, only one of the two seeds within the husk comes to maturity. Most of the coffee is grown in Yemen and the adjoining vilayets, and it received its name because it was formerly marketed at the port of Mocha. Of late years it has been shipped from Hodeida.

The business is in the hands of Arab merchants, and the coffee is carried to Hodeida by caravans. On its way it is carefully sorted by hand into three or more grades. The finest grade is sold to wealthy Turkish customers at from three to five dollars per pound; the inferior grades command prices varying from thirty cents to twice or three times as much. Very little of the product ever passes outside of Turkey. All the Mocha coffee grown in Yemen would not much more than supply New York City.

The pearl fisheries along the Arabian coast of the Persian Gulf are also controlled by Arab traders. From there are obtained some of the finest pearls to be found, and also many tons of mother-of-pearl shells. The yearly product of the fisheries is thought to exceed more than two millions of dol-

lars in value. The pearls are found in a species of oyster, and to obtain them the divers must go to the bottom in from thirty to ninety feet of water. Expert divers can remain under water as long as two minutes.

The oysters are taken ashore to be opened, and Turkish inspectors are on hand to levy a tax on the product. A few pearls may escape him, especially if he is temporarily blinded by the glare of several piasters; but the pearl industry is taxed for about all that it is worth.

Mecca, the birthplace of the Prophet Muhammad, is the city to which every disciple of Islam is supposed to make a pilgrimage at least once in his lifetime. The chief income of the inhabitants of Mecca is obtained by renting rooms and entertaining the visiting pilgrims who flock thither.

In the centre of the city is the so-called Sacred Mosque, or area, which is entirely enclosed by a covered structure of colonnades having minarets and cupolas. Within the centre of this enclosed space is a cube-shaped building called the Kaaba, which contains the famous sacred Black Stone. This stone, probably of meteoric origin, gives to the building its sanctity, and is an object of the greatest veneration to every pious Moslem, who kisses it repeatedly. There is also within the enclosure a building containing the holy well, Zemzem, the only well in Mecca.

No unbeliever is permitted to enter the sacred enclosure, much less to pollute the Holy Kaaba by his presence. A few infidels disguised as pilgrims, at the risk of their lives, have visited this sacred place.

The preparations for pilgrimage are unique. The pilgrims assemble near Mecca during the holy month and begin the sacred rites by bathing and assuming the sacred garb. This suit consists of two woollen wrappers, one worn around the middle of the body and the other around the shoulders.

With bare head and slippers covering neither heel nor instep the pilgrim sets forth on his holy journey.

While wearing this dress he is admonished to bring his thoughts into harmony with the sanctity of the territory he now traverses. He is not to shave, anoint his head, pare his nails, or bathe until the end of the pilgrimage. Among the various rites to be performed after reaching Mecca is walking seven times around the Kaaba, first slowly, then quickly. Before leaving the city the pilgrim drinks water from the holy well, Zemzem.

Many pious pilgrims visit Medina, now the terminus of a railway, before going on to Mecca. This is another of the sacred cities of Islam, since it is the scene of Muhammad's labors after his hegira from Mecca; it also contains his tomb. Formerly no unbeliever was permitted to traverse the streets of Medina or look upon the tomb of the great prophet, but tourists are now allowed within the gates. The city is enclosed by a wall forty feet high which is flanked with thirty towers. Two of its four gates are massive structures with double towers. Like Mecca, Medina is supported chiefly by pilgrims.

CHAPTER X

THE SAHARA

An expanse of land as large as the main body of the United States stretches across the northern part of Africa. From the Atlantic Ocean to the Red Sea, and from the foot of the Atlas Mountains to the Sudan, it is a weird panorama of rock waste—level, rugged, shingly, and mountainous, according to locality. In places only it is penetrated by large and permanently flowing streams. On the eastern borderland the Nile pours a mighty flood, winding a sinuous pas-

sage along its self-made flood-plain, the Egypt of history. In the west the Niger has forced its way into the confines of the desert and then, as if rebuffed, turns its course southward.

This great domain of the simoom has every diversity of surface. The higher summits of the Tarso Mountains are eight thousand feet above sea level; the Shott, a chain of salt lakes south of the Atlas Mountains, are about one hundred feet below sea level. The depression in which these lakes is situated probably was once the head of the Gulf of Sidra; but the never-ceasing winds have partly filled the depression, cutting off the head of the gulf in the same manner that wind-blown sands severed what is now Imperial Valley from the Gulf of California. Around the briny lakes are marshes of quicksands, and woe betide the luckless traveller who strays to the one side or the other of the beaten trails. Unless help is at hand, life will have neither joys nor troubles for him after a few brief minutes of struggle.

The Sahara proper begins at the south slope of the Atlas Mountains. Where there are no Atlas Mountains, it begins almost at the Mediterranean's edge. In the valleys of the Atlas and along the Mediterranean coast there is a strip of fertile land, wide here, narrow there, that produces grain and fruit. The Arabs call it the *Tell*. "Beyond the Tell is Sah-ra," or the Sahara. This is the name which the Arabs apply to the archipelago of fertile spots, or oases. Beyond the zone of oases is the desert. One becomes instantly and painfully aware that it is a desert on leaving the last oasis. Go a thousand miles southward, eastward, or westward from Tripoli, and one encounters but a single thing—an ocean of orange-colored rock waste, the Guebla of the Arabs.

The desert is a desert for want of water only. There is no lack of nutrition in the soil, nor is there anything in

On the sands of the desert

surface or temperature that makes a desert unproductive. Temperature and winds reach great extremes in fierceness, however. The temperature of the air in the noonday sun will often exceed one hundred and forty-five degrees; it may reach one hundred and fifty-five degrees. In the shade it frequently climbs to one hundred and thirty degrees in the vicinity of the tropics. Unless one is at a considerable altitude there is not much relief at night, though the thermometer may drop to ninety degrees. Farther north, however, and at an altitude of five thousand feet or more, the temperature of the night is even more cruel than that of the day. Immediately after sunset a sharp chill becomes perceptible. At first it is a welcome relief from the intolerable heat. By nine o'clock it begins to cut like a stiletto, and at midnight the water suspended in shallow dishes clinks into ice. The drivers burrow deep into the sand and wrap woollen baracans about them; the camels shiver and even blubber like whipped bullies.

The air is so dry, however, that the extreme heat of day is by no means insupportable. Sunstroke is almost unknown, and even the tragedy of perishing for want of water is very rare; for the caravan drivers know just where to find water, and there are many hidden watering places that are known to the crafty Tuaregs and Bedouins. Many of the watering places are wells that have been sunk in various localities along the caravan trails. The intense heat, great depth of rock waste, and dry air are not favorable to the above-ground flow of rivers. But nearly every river has an underground flow that is pretty likely to exist all the year round.

One may follow a stream of considerable volume down the southern slope of the Atlas Mountains. The volume of water grows less and less until at last it apparently disappears. Not all is lost by evaporation, however; possibly

the greater part sinks into the porous rock waste. And the rock waste?—perhaps it may be twenty, fifty, or one hundred and fifty feet deep. At all events, the water sinks until it reaches bed rock or clay through which it cannot pass. Then it flows along what may once have been an above-ground channel until fierce winds and cloud-bursts buried it deep.

But the half-savage dwellers of the desert know just where to tap these underground reservoirs and streams; even the dumb animals know instinctively where to look for water. It is merely a question of instinct coupled with experience, and the animal's judgment is about as good as the man's. When one finds the spot, it is necessary only to dig. The water may be two feet below the surface or it may be ten feet. When the moist sand is reached the task is half over. A foot or two more and the hole begins to fill. The water is hot, brackish, and repulsive to the taste, but it is water —and in the desert, water is water!

The simoom is also an institution of the desert. The simoom is unmistakably a wind, and surely no one who has not had the experience can appreciate it. Even the West India hurricanes or the typhoons of the China Sea are more kindly. They have plenty of destructive energy, it is true, but the simoom has all this and much else besides. It comes not without warning, but the warning and the wind are not far apart. The approach of the simoom is a dense black cloud of whirling and seething fine dust. As it strikes one, the choking, suffocating blast of hot air and dust overcomes everything that has life. The caravan men and the animals as well turn their backs to the wind and lie down with faces close to the ground. In a minute or two the full strength of the blast is on and the simoom is picking up not only the fine rock waste, but the coarser fragments as well, and is hurling them along at Empire State Express velocity.

One might as well try to face a hail of leaden bullets. It is a cruel blast that neither animal nor human being can withstand. The camels crouch with their heads pointing away from the wind and nostrils close to the ground; their drivers lie prone with faces in little hollows scooped in the sand.

Perhaps the full blast of the simoom may last an hour—perhaps two or even three hours. In lighter strain it may continue a whole day. When, finally, it ceases the air is thick with fine dust; one can see scarcely a rod away. Sun and sky are hidden, and the blackness of a tornado or of a London fog prevails. The fine dust floating in the air may not settle for several days. Perhaps a week afterward there may be a haze that partly obscures the sun. The dust, finer than the finest flour, pervades everything in the desert. One's clothing is full of it; one's hair becomes harsh and matted; the skin becomes rough, cracks and peels; the eyes are inflamed; mouth, lips, and nostrils are swollen. But the great bodily discomfort resulting from the simoom does not last forever; it gives place to bodily irritation of some other sort, which is indeed a grateful change merely because it is a change.

The sand dunes of the Sahara are interesting to those who are not compelled to travel among them, but to the unfortunates who traverse them they are almost heart-breaking. Imagine oneself standing on an elevation a few hundred feet higher than the surrounding country. There is but one landscape—waves upon waves of the loose rock waste, for convenience called sand, as far as the eye can reach. Sometimes the waves are in long windrows, but oftener they are short and choppy like the surface waves of midocean.

Unlike the ocean waves, in which only the form moves forward, while the water composing it moves up and down only, the sand dune and the material of which it is composed

are both moving in the direction of the wind. A breeze even of five or six miles an hour will keep the lighter surface dust moving freely, while a twelve-mile wind will not only sweep along much larger particles but it also carries more of them. And just as the surface, or "skin," friction forms waves at the surface of water, it also piles the desert sand in wave-like dunes.

The loose bits of rock waste are carried along, up the windward slope of the dune until they roll over its crest, where, no longer impelled by the wind, they come to rest. Thus, the crest, built forward by new material constantly added, is advancing. Valleys are filled; old stream channels are obliterated; and the inequalities of the surface are levelled off until the whole landscape is one of shifting, drifting sand.

Notwithstanding all these drawbacks, the Sahara and the arid lands southward to the Sudan are by no means destitute of life and wealth. It is an almost universal custom to speak of the barren condition of the desert. The contrary is the truth; there is no soil elsewhere so fertile and productive. It is vastly superior even to the soil of the lands reclaimed from the bottom of the North Sea.

Water is the magic wand that makes the sands of the Sahara bring forth crops that are marvellous both in quantity and quality. No fruit grown elsewhere in the world can compare with that grown on desert lands, and the French engineers are planning the means whereby water may be obtained. Surface water that is available to irrigate the wastes of the Sahara does not exist. The level of the Nile is so far below the surface on both sides of its own flood-plain that its waters cannot be used for the reclamation of any part of the Libyan Desert, and the same is practically true of the Niger, which barely more than touches the borders of the Sahara. The few wadys, or "dry washes," are desti-

tute of water except when a cloud-burst may fill them; but this happens at intervals of years only.

The engineer takes into his confidence a caravan driver —perhaps an Arab, possibly a Berber, but quite as likely a slave. And the long experience has taught the caravan man where to find the precious water. The engineer then brings his science into play and drives an artesian well. The well thus driven may be a "gusher," but for most of them pumps are required to raise the water to the surface. The best well, however, furnishes water enough to irrigate but a very small area. Indeed, all the lands of the Sahara together irrigated by artesian wells would make an area scarcely larger than the State of Delaware, and all the water thus obtained would not supply New York City!

Nevertheless, the water obtained by artesian wells has proved a great blessing to the dwellers of the desert. If the water is found along one or another of the numerous caravan routes, an increase in caravan commerce is apt to result, for along many routes the volume of caravan commerce depends very largely on the number of wells. The location of artesian wells has also led to the opening of trade along new routes as well, for wherever water can be found there will be camels to drink it.

The date palm is essentially a plant of the desert, or, rather, of the oasis. Nowhere else does it grow in such profusion as in northern Africa. The number of productive trees there is estimated to be anywhere from ten million to twenty million, though the estimate is but little better than a guess. At its full growth the date palm is a most beautiful object. Usually the feathered tops of the trees are the only foliage to relieve the harsh landscape. Like the bamboo, every part of the tree is used. The leaves may be made into fans, or shredded and woven into mats. The wood is used in making the framework of

buildings, and the waste material is very handy as fuel. A refreshing fermented drink and a most vile liquor are prepared from the juice. But the fruit, when properly prepared, is the chief food of many thousands of men and beasts. Even the stones, or "pits," of the dried fruit are useful; those which are not sent to Italy to be used for adulterating coffee are made into an "oil-meal" for fodder.

Esparto grass, called "alfa" or "halfa" by the Arabs, is another unique product of the Sahara. In spite of its name, it is not a grass but a flowering plant whose stalk has a tough fibre useful in making cordage and paper. When the plant turns brown and has become dry to the root, the esparto picker gets busy.

By four o'clock in the morning he is at work, his heavy woollen baracan, or blanket, wrapped tightly about him, for the air is not only chilly but almost freezing cold. By sunrise the chill begins to disappear, and a few brief moments is the only interval between piercing chill and midsummer heat. The baracan is quickly shed and the fez, if the picker is rich enough to possess one, is discarded for an esparto hat with rim of mammoth proportions. Esparto grass sandals protect his feet.

Almost all the animal life of the Sahara is deadly, and the esparto grass picker is constantly facing danger. The clump of esparto, into the bottom of which he must reach to cut the mature stalks, is quite likely to be the lair of a poisonous viper; and if the reptile sinks its fangs into the flesh of the unfortunate picker, long weeks of suffering and disability—perhaps death—are in store for him. Between the bite of a rattler and that of an esparto viper there is little to choose.

The scorpion is another peril to the esparto picker. The great rock-scorpion of the Sahara is about as ugly as the centipede of Arizona and Mexico; in size it is also about as

large—from six to ten inches in length. Its sting, too, is about as dangerous as the fangs of the rattler. But the esparto picker has a method of heroic treatment for both the bite of the viper and the sting of the scorpion. He squats calmly upon the sand while a brother picker cuts out the flesh that has been pierced. If he survives the twenty-four hours following, he is pretty likely to pull through. If not—well, the vultures know when and where to look.

The esparto grass is delivered to the nearest local market compressed in bales of five or six hundred weight, held together by a coarse netting of esparto weave, and shipped to Europe. Nearly all of it goes to Great Britain. There it is shredded and made into cordage, coarse cloth, or paper.

But the esparto has a rival so far as its use in making paper is concerned. The wood pulp of Norway and the United States is slowly displacing it, and in time esparto will be but little used except for making cordage or gunny cloth. Already the French Government is having troubles of its own in providing employment for the esparto pickers, but it is not likely that such a useful plant will be discarded; on the contrary, its use is likely to increase in the future.

The camel is the institution upon which the commerce of the desert depends. A more awkward, ungainly beast can hardly be imagined—a shambling collection of humps, bumps, knobs, protruding joints, and sprawling legs seemingly attached to a head and neck in the near foreground. But that shambling gait will carry a load three times as heavy as the stoutest pack mule can bear, and it will carry it twice as far in a day.

A horse or a mule must be fed twice a day, but a camel will worry along for a week at a time with nothing more substantial than its cud. Horses and mules cannot traverse regions where the watering places are more than twelve hours

apart, unless water be carried in storage; but the camel is its own storage reservoir, and can carry a supply sufficient to last for ten days.

At the end of his week of fasting the hump of the camel has shrunken to a fraction of its former size. When the animal has a few days of feeding the hump grows to its

A caravan crossing the desert on the road to Jaffa

former proportions again. Indeed, the hump is merely a mass of nutrition ready to be formed into flesh and blood.

Within the paunch of the animal and surrounding its stomach are great numbers of cells capable of holding seven or eight gallons of water. When the camel drinks copiously these cells become filled and afterward slowly give up the water as the stomach requires. It may be truly said that the camel is a camel because of the desert and not in spite of it.

The sparse population of the Sahara—Arabs, Berbers, and negroes—are dependent upon the camel, for until the

railway shall traverse the Sahara the camel will be practically the only means of transportation. The camel's flesh furnishes about the only meat consumed by the dwellers of the desert, for ordinary cattle can live only in a few localities along the desert border lands.

The native people of the desert are mainly of the race to which the Arabs also belong, although there are many Arabs and negroes. The Tuaregs and Bedouin Arabs are the best known. The Tuaregs are thought to be the descendants of the Berbers and of the same race as the Carthaginians, whom the Romans many times defeated but never conquered. They have whiter skins than the Arabs and in appearance are perhaps the finest peoples of Africa. They are also the most ferocious and blood-thirsty villains on the face of the earth. Many of them live in the white-walled cities such as Ghadames, Kand, and Timbuktu—all large centres of population.

Their government is well organized. Each of the larger tribes is governed by a sultan, and in each there are several castes—a sort of nobility of unmixed Tuareg blood being at the head and negro slaves at the lower end of the social ladder. The families of the highest caste are usually well-to-do, and both the men and the women are taught to read and write. The garments usually worn by a Tuareg man consist of white trousers, a gray tunic with white sleeves, sandals of ornamented leather, and a white turban. When away from home the Tuareg covers the lower half of the face by a cloth mask.

The usual occupation of the Tuaregs is twofold—to guard caravans or to rob them. The average Tuareg is perfectly indifferent as to which he does. A caravan from the Sudan enters, we will say, Kano. The garfla sheik pack master, or superintendent, goes at once to the financial agent of the sultan and pays the usual liken, or tariff

charges. Then he goes to the sultan himself and incidentally leaves in his possession a generous money present. Then, if he desires, he may hire half a dozen or more guards.

The hiring of these will insure the caravan against theft or robbery on the part of the predatory bands living at Kano. The guards will also faithfully defend the caravan in case of attack by Bedouin Arabs. On the other hand, should the garfla sheik forget the present to the sultan, or neglect to hire guards, those same Tuaregs would be the first to attack and loot the caravan.

The Bedouin Arab is the chief trial of the caravans. He is always a foe to them; and although he ostensibly herds camels and horses, his real occupation is robbery and pillage. For days nomadic Arabs will follow a caravan, keeping always out of sight. Most likely a band of a dozen or more mounted on swift horses will survey the caravan from a distance at which they are not likely to be discovered. Then they make their way ahead of it to some point where a dune or a gully will conceal them. Then, just as the end of the caravan drags by, there is a sudden sortie and a rattling musket fire. And before the guards can gather to the defence half a dozen camels are cut out of the train, a driver or two is shot down or pierced with assegais, and both the robbers and their loot are beyond the reach of the guards.

But perhaps the greatest value of the desert is its effect upon the climate of Europe. Hot winds blow from the Sahara in all directions; the northerly winds, crossing the Mediterranean, are not only tempered thereby, but the desert blasts tempered and filled with moisture finally reach the southern slopes of Europe, where they convert the nutrition of the soil into bountiful crops of corn, wine, and oil.

The conquest of the great African desert is already in

sight, and the railway will be its master. The Cape to Cairo line is no longer a vision of the future; the ends of its two parts are rapidly shortening the interval that separates them and they are almost in sight of each other. When the lines that are projected from the Mediterranean coast shall have traversed the stronghold of the Tuaregs to penetrate the wealth of the Sudan and the Kongo, the Sahara will have become merely an incident.

CHAPTER XI

POLAR REGIONS—THE CONQUEST OF THE ARCTIC

EXCEPTING the arctic and the antarctic regions, with their fortifications of eternal ice and snow, intrepid explorers have made known nearly every part of the world. There Giant Frost guards his frozen secrets and defies man to wrest them from him. Many a hero has perished in endeavoring to solve the Sphinx-like riddle of northern lands and seas. Many a gallant ship has found its grave in northern ice-clad waters. Yet there has never been a lack of adventurous spirits to continue the work.

But one after another the strongholds of nature have gradually yielded to persistent attacks. Especially is this true of the arctic regions, of which not more than two million square miles of sea and land remain to be explored.

Buffeted by adverse winds and floating ice-fields, venturous explorers have drawn nearer and nearer to the north pole. Again and again, the attack has been renewed, until, after half a lifetime, Robert E. Peary, an officer of the United States navy, made a brilliant dash and planted the national ensign at the pole.

The story of arctic exploration and discovery is filled with interest. It is pathetic, tragical, and calculated to awaken the deepest emotions. Nevertheless, it is enlivened by brilliant exploits, deeds of daring, and acts of heroism.

For many years the search for a northern passage to India in the furtherance of commerce was the chief incentive to arctic exploration. Even more than a century before Columbus discovered America, two Venetian brothers named Zeno sought a northwest passage to the Orient, believing that the difficulties in navigating it would be offset by the shortening of the route.

The success achieved by Spain during the fifteenth and sixteenth centuries in discovery, conquest, and colonization incited England to find a northwest passage, in the hope that such a route, by shortening the distance to the East Indies, would extend her commerce.

After the discovery of the mainland of North America, Sebastian Cabot, under the patronage of Henry VII, planned a voyage to the north pole, thinking that would be the best route to ancient Cathay. He proceeded only as far as Davis Strait; then, becoming discouraged by the immense fields of ice, he turned the prow of his vessel homeward.

Soon afterward the Muscovy Company of London sent out an exploring expedition with instructions to find a northwest passage. This expedition, taking a different route from its predecessors, reached Nova Zembla. But the ice-fields forced the vessel back to the shores of Lapland, and the ship was never spoken again. Years afterward the ship's company were found frozen in death.

Next in importance came the renowned Frobisher, a strong advocate of a northwest route. He made three voyages to the Arctic Ocean, the last two being under the patronage of Queen Elizabeth. Frobisher believed that fabulously rich fields of gold existed in the north, and his

expedition was organized for the purpose of discovering them. His search for precious metals was fruitless, but he added much to the world's knowledge of polar regions, and he has been remembered in the strait that bears his name.

The Muscovy Company again sent out an exploring vessel, this time under the able navigator Henry Hudson, with orders to go "direct to the north pole." He did his best to carry out his instructions and, sailing along the northern shore of Spitzbergen, reached latitude 81° 30′ north. Finding the route utterly impracticable, he returned home. In all, Hudson sailed on four voyages of discovery, twice in the employ of English companies and twice in the employ of the Dutch East India Company.

In one of his voyages under the Dutch, after advancing as far north as he deemed prudent, he turned southward and cruised along the Atlantic coast. Entering New York Bay, he proceeded up the broad river that now bears his name, believing at first that he had found the coveted short route to India. Soon he was undeceived, for as he went farther up he found the seeming passage to be merely a large river. He gave his employers such a glowing account of the valley of the Hudson River that the merchants of Holland sent out ships to establish trading posts along the river and to trade with the Indians.

On his fourth voyage, while seeking a passage northwest, he discovered the strait and the bay both of which bear his name. Desiring to continue his explorations the next year, he sailed westward on the bay and wintered on the island of Southampton. In the spring he again tried to find the long-wished-for passage.

The long, cold winter and lack of suitable food told heavily on his men. They became badly demoralized and declared that they would not remain longer in such an inhospitable region. When Hudson insisted, the men mutinied. Seiz-

ing their commander, they placed him with his son and five sailors in an open boat and sailed away. After this cruel act of the mutineers, no trace of Hudson or those who were with him was ever found. But Hudson's fame will never die. Historians will ever laud his achievements, and his name is indelibly inscribed on the map of the world. The ringleader of the mutineers with five of his companions was afterward killed by the natives, and several of the others starved to death. The rest of the crew succeeded in getting the ship back to England; there they were tried, found guilty of mutiny, and sent to prison.

In 1616 the intrepid William Baffin took up the search. He penetrated the bay bearing his name and explored the passages of water westward to the mouth of Lancaster Sound.

Later the Russians became interested in exploration. Among the explorers Captain Veit Bering of the Russian navy was the most eminent. In the early part of the eighteenth century Bering was commanded by Peter the Great to take up the search for the long-sought passage. He explored the northeastern coast of Asia as far north as sixty-seven degrees latitude, discovering a fact hitherto unknown, that North America is separated from Asia by a narrow passage of water containing small islands. The passage received the name Bering Strait from its discoverer, and the same name was bestowed upon the sea leading to it.

About ten years afterward Bering determined to explore the northwest coast of North America. He landed twice upon the coast, but, being driven back by violent storms, was at length wrecked on an island, where he died. His crew, though suffering terrible hardships, lived through the winter. With the coming of spring, however, they rigged a craft from the stranded vessel in which a few survivors reached the coast of Asia.

In 1743 the British Government offered a reward of twenty thousand pounds for the discovery of a northwest passage by the way of Hudson Bay. Thirty-three years afterward a like reward was offered for the actual discovery of the north pole and the same amount for the exploration of any navigable passage. The sum of five thousand pounds was also offered to any one who should approach within one degree of the north pole. These standing rewards greatly stimulated arctic exploration.

Of the many voyages of exploration that followed, Sir John Franklin's last expedition was the most tragical. This expedition was fitted out by the British Government with the necessary supplies and scientific instruments for a three years' cruise. Two stanch vessels, the *Erebus* and the *Terror*, both of which had been previously employed in antarctic exploration, were selected to stem the ice-fields of the north, and a tender with extra supplies accompanied them as far as Davis Strait. The vessels were last seen in Lancaster Sound moored to an iceberg, where they were spoken by a whaling ship homeward bound.

Three years having passed and no tidings having been received from the expedition, all England became extremely anxious concerning the safety of the explorers. The British Government then sent out two vessels to seek Franklin, but no trace of the missing commander or his men was found.

The government then redoubled its exertions, supplemented by private parties, and in 1850 no less than twelve vessels were vigorously searching the arctic lands and waters for their lost brothers. Lady Franklin spent her fortune in endeavoring to find trace of her noble husband.

The heart of humanity was touched with the deepest sympathy and moved by the noblest motives. The United States Government, aided also by private citizens, fitted out vessels to continue the search. At one time ten of the

searching vessels met in the Arctic. The results of these expeditions were meagre in securing trace of the lost ones, but they greatly enriched our knowledge of northern lands and seas.

Not until five years after the *Erebus* and *Terror* left England was trace of the explorers found. Near the head of Franklin Strait, off the shore of King William Land, evidence of an encampment of some of the men was discovered, and at Beechey Island, near by, carpenters' tools, empty meat cans, and the graves of three of the men threw more light on the mystery of the ill-starred expedition. A few years later, at Victory Point, Lieutenant Hobson found a record of the death of Franklin, the date being July 11, 1847.

Charles F. Hall, a native of New Hampshire, but long a resident of Ohio, who had been a reader of arctic literature, became deeply interested in the search for Sir John Franklin. Obtaining financial aid from different sources, he made four voyages to the arctic, the first being devoted to searching for Franklin's men and in solving the mystery of their disappearance. His third voyage was the most fruitful one in securing results. Hall believed that the Eskimos knew more about the lost explorers than they were willing to tell, and that if he could but gain their confidence he could extract from them the story. In furtherance of his plan, he resolved on his third voyage to live with them several years. In 1864 he started on this voyage north. On his arrival in the arctic he sought out the natives and made himself one of them, adopting their mode of life and food.

He spent five years living and travelling with them. Having won them over, he obtained the story of the ill-fated explorers. He learned that one of Franklin's vessels had actually made the northwest passage to O'Reily Island, southwest of King William Land. Five men remained on board alive, but the vessel was abandoned by the crew. The

next spring the Eskimos found it in good condition frozen fast in the ice.

The skeletons of Franklin's men were found scattered over King William Land, where they had perished one after another from starvation and cold. Some had engaged in conflict with the natives in endeavoring to secure food, but being weak from hunger were unsuccessful. Of the one hundred and five men who accompanied Franklin not one was ever found alive.

During the year 1850 the problem of the northwest passage was solved by Captains M'Clure, Collinson, and Killet. South of Melville Island, M'Clure, who had sailed through Bering Strait, met the ship of Killet which had come through Lancaster Sound. M'Clure, having wintered near the connecting waters, had really established the existence of the passage by observation before the meeting. Twenty days later Collinson came up in his ship. Finding the problem of the northwest passage solved, he turned to the southeast and completed the passage in another direction.

It thus became evident that so far as commercial purposes were concerned a northwest passage was impracticable and that further northern exploration must be considered in the light of scientific and geographic value only.

Hall's labors did not cease with his discovery of the Franklin expedition. He became an enthusiast concerning the arctic and seemed to enjoy its weird icy scenery and attendant perilous excitement. Believing that he could reach the north pole if he had a properly equipped expedition, he planned a fourth voyage and appealed to Congress for assistance.

A generous appropriation was made by Congress, and on July 3, 1871, the expedition set sail from New London, Conn., carrying a full crew and several scientists. The vessel, which was named the *Polaris*, touched at several

places on the western coast of Greenland to secure additional dogs and skins suitable for arctic clothing, and then steamed north as far as seemed safe, to establish winter quarters preparatory to making a dash for the pole in the spring.

The vessel passed through Robeson Channel into the polar ocean, reaching 82° 11′, then the highest point ever reached by a ship. Not finding a good harbor, Hall sailed south about fifty miles. He anchored near the Greenland shore to the lee of a stranded iceberg. Building material for a house and part of the stores were removed to the land in case anything happened to the ship. Then the ship was banked up with snow and part of the deck was covered with canvas to keep out the cold.

The weather being propitious, Captain Hall thought best to take a sledge journey to find the lay of the country. He ordered the dogs to be well fed, and accompanied by two other sledges advanced northward about fifty miles, making side trips to take observations. At the end of two weeks he returned seemingly perfectly well, but in a few hours complained of illness. Thirteen days afterward he died. The date of his death was November 8, 1871, just a little more than four months from the time he left the port of New London buoyant with hope.

The command of the expedition now devolved on Captain Buddington, a man of dissipated habits and lacking in discipline. During the winter and spring severe storms crashed the ice-pack against the sides of the vessel, causing it to leak. In the meantime exploring parties were sent out with sledges and boats, gathering not a little knowledge concerning the west coast of Greenland. Then the vessel began to leak badly, and Captain Buddington ordered all hands on board for return home.

Great fields of ice still covered the sea, and it was with extreme difficulty that the vessel made its way through them

southward. A severe gale damaged the vessel still more, and as it seemed certain that it could not float much longer, preparations to abandon it and to move at once to the ice-floe were made.

At the dead of night, in the face of a fierce gale, a part of the ship's company and stores were transferred to the ice. Then the heaving billows broke the vessel loose from the floe, separating the men on the ice from those on the vessel. With eighteen companions Captain Tyson lived on the ice-floe which moved southward, breaking off piece after piece, for a period of six and one-half months, suffering incredible hardships from cold, hunger, and constant fear. Finally, they were sighted off the Labrador coast by the ship *Tigress* and rescued in a starving condition. The story of this ice-floe journey of one thousand three hundred miles is one of the most thrilling in maritime annals. Fortunately, there were two Eskimos on the ice-floe skilled in the capture of seals, else the entire company would have starved to death, since but a small portion of the provisions had been transferred to the floe when the vessel parted from it. The devices for sustaining their lives during the journey form interesting reading. Strange to relate, no one was seriously ill and no deaths occurred during this remarkable ice voyage.

After drifting a while the *Polaris* was purposely beached on the Greenland shore and the stores placed on land, where a house was built in which to spend the second winter. In the spring two boats were constructed in which the company started southward along the coast, where they were finally picked up by a whaling vessel.

The conquest of the northeast passage was not achieved until the latter part of the century. In 1878 Baron Nordenskjold, a Swedish explorer commanding the *Vega*, entered the Arctic and sailed eastward along the Russian and Siberian coast. Nordenskjold was the first navigator to

double Cape Chelyuskin, the northern cape of Asia. The *Vega* reached Bering Strait where she was nipped by the ice-pack. In the following spring she reached Japan in safety.

In 1879–80 Lieutenant Frederick Schwatka set out on an overland expedition northwestward for Hudson Bay, to gather knowledge concerning the great Arctic Plain of

Peary's ship, the *Roosevelt*

North America. Schwatka's was probably the longest sledge journey ever made up to that time. With a small party of men, his dog sledges covered a distance of three thousand miles. Schwatka found the skeletons of several members of Sir John Franklin's party. These he buried on King William Land.

In 1881 the De Long expedition, in the steam cruiser *Jeannette*, met disaster off the Siberian coast. The *Jeannette* was sunk and her officers and crew in three boats

abandoned her. One boat was never heard of afterward. De Long and his party starved in the delta swamps of the Lena River. Chief Engineer Melville and his party were rescued in the Lena River.

In 1881 also the International Polar Conference attempted to establish a chain of stations around the pole as far north as possible. The United States and several of the European nations were represented in the organization. Two expeditions were sent out by the United States; one at Point Barrow, under Lieutenant Ray, the other at Lady Franklin Bay, opposite the Greenland coast, in latitude 81° 40′. The latter was in charge of Lieutenant, now General Greely. In a sledge journey along the north coast of Greenland, Lockwood and Brainard reached the latitude of 83° 24′. The observations of Greely and Ray added not a little knowledge concerning the meteorology and tides of the arctic regions. The sledge journey of Lockwood and Brainard practically established the fact that Greenland is an island.

Of all attempts to reach the pole, the most daring was that adopted by S. A. Andree, a Swedish explorer. Andree had been to the polar regions before, and being something of an aeronaut, believed that he could reach or pass over the pole in a balloon. In carrying out his plan he had constructed a monster balloon capable of floating in the air thirty days, due allowance being made for the daily escape of gas by permeation through the envelope. This balloon, with necessary accessories, was shipped to Danes Island, one of the Spitzbergen group. Everything being ready July 11, 1897, Andree set forth on his perilous trip accompanied by two companions. The balloon carried a load of about five tons, including food, clothing, ballast, scientific instruments, and men.

On being let loose the balloon arose six hundred feet,

and then descended to the surface of the sea owing to the entanglement of the guide ropes and ballast lines. Three heavy guide ropes nine hundred feet long were used, to which were attached eight ballast lines two hundred and fifty feet long. The ropes were cut and ballast was thrown out, when the balloon again rose and the wind bore it away over a mountainous island one thousand five hundred feet high. In an hour it had passed below the northeastern horizon. Three message buoys were dropped on the day of Andree's departure, reporting fine weather, all well, and altitude eight hundred and twenty feet; from that time on no traces of the daring unfortunates have ever been found.

Fridtjof Nansen, who had spent some time in the exploration of Greenland, had also reached the conclusion that a polar current sweeps across the Arctic Ocean from Bering Sea to the north coast of Greenland. He therefore set out with a picked crew in a small steamship, the *Fram*, 1893, entering the Arctic at Bering Strait. After the *Fram* had been caught in the ice-pack, Nansen and his companion, Johansen, started toward the north pole with dog sledges. They reached latitude 86° 14′; finding that the ice was drifting southward, they made for Franz Josef Land, where they spent the winter, and then started for Spitzbergen. On their way they were found by members of the Jackson-Harmsworth expedition, by whom they were rescued. The *Fram* also returned safely. The existence of the polar current was not established.

In 1900 Captain Cagni, a member of the Abruzzi Polar Expedition, starting from Franz Josef Land, made a dash across the ice toward the pole. He succeeded in reaching latitude 86° 34′, the nearest approach to the pole up to that time.

Only a few years afterward, 1905–6, Amundsen, in the steamer *Gjoa*, found a more southerly northwest passage

from King William Land than that followed by Collinson. It was comparatively free from ice. Amundsen was the first to penetrate the northwest passage in a continuous voyage. The result showed plainly that as a commercial route the northwest passage was out of the question.

The man who finally succeeded in reaching the pole is the intrepid arctic explorer, Robert E. Peary, of the United States navy. In the first record-breaking trip Peary started in July, 1905. Sailing through Davis Strait, Baffin Bay, Smith Sound, and Robeson Channel to Grant Island, which lies west of the northern part of Greenland, he went into winter quarters at Cape Sheridan.

In the early spring, when the daylight was an hour long, Peary set out for the north pole over the ice-clad ocean with sledges drawn by dogs. Delayed by storms and open water in some places, he succeeded after incredible hardships and suffering in reaching 87° 6′, the highest point up to that time reached by man, a distance only two hundred miles from the north pole.

In previous trips Peary had crossed the northern part of Greenland twice at the risk of his life, each time bringing much knowledge of the north coast of Greenland. During one of his voyages Peary brought home three meteorites. The largest, weighing more than thirty-six tons, is now in the Museum of Natural History of New York City. These are among the largest meteorites ever found, and it is an interesting fact that so many were found in Greenland.[1]

[1] Isolated masses of native iron are usually of meteoric origin, but to determine whether or not the native iron fell from the sky a portion of the surface is ground off and polished; then the polished surface is etched with acid. If crystalline lines are plainly brought out, there can be no doubt of its being of meteoric origin.

The following excerpt from the *American Museum Meteoric Guide* will make the matter clear: "The iron of meteorites is always alloyed with from six to twenty per cent of nickel. This 'nickel-iron,' as it is commonly called,

Peary's last and successful trip began when the steamship *Roosevelt*, commanded by Captain Bartlett, sailed out of New York harbor, July 6, 1908. The vessel traversed Baffin Bay and reached Cape York August 1. At Etah, an Eskimo settlement, three weeks were consumed in stor-

Commander Robert E. Peary and three of his Eskimo dogs on the *Roosevelt*

ing supplies and selecting Eskimo guides and purchasing dog-trains. The *Roosevelt* then proceeded northward through the narrow strait that separates Greenland from Grant Land. The party went into winter quarters near Cape

is usually crystalline in texture, and when it is cut, polished, and 'etched' a beautiful net-work of lines is brought out, indicating plates which lie in positions determined by the crystalline character of the mass. This net-work of lines constitutes what are called the Widmannstattian figures, from the name of their discoverer. When these figures are strongly developed the meteoric origin of the iron cannot be questioned, but their absence does not necessarily disprove such an origin. Native iron of terrestrial origin is extremely rare."

Sheridan at the head of the strait. The winter was spent in exploration and in preparation for the sledge journey. The necessary supplies for the journey were carried to Cape Columbia, the northerly point of Grant Land. The sledge party started northward from Cape Columbia February 28—seven members of the expedition, seventeen Eskimos, and nineteen sledges.

When the expedition reached latitude eighty-eight degrees, Captain Bartlett and Professor Marvin, with most of the Eskimo guides, were ordered back; Peary with his companion, Hensen, and several Eskimos started on the final dash. Fortunately the ice was smooth, and but few breaks, or "leads," were encountered. It was not difficult to make twenty-five miles or more a day during several days of the journey. At last a temporary break in the clouds gave Peary an opportunity for observation, which showed his latitude to be 89° 57′. Ten miles more were made, and another observation showed that the party had actually gone several miles beyond the pole.

A cairn of ice blocks and snow bearing the American flag was erected approximately at the pole, April 7, 1909, and the party started on the return trip. There being a plain trail and smooth ice, the return trip was made in about half the time required for the outward trip. The reserve party was joined at Cape Columbia, and all hands returned to the *Roosevelt*, which was at anchor near Cape Sheridan. The only fatality of the expedition was the death of Professor Marvin, who was accidentally drowned while on his return to Cape Columbia.

The open polar sea which had been observed by Kane and several other explorers was closed by ice at the time of Peary's dash; indeed, the entire route lay over ice and snow that apparently was several years old. After leaving Cape Columbia no land sky was seen anywhere about

the horizon. A single sounding was made about five miles from the pole, but no bottom was found at fifteen hundred feet, the length of the sounding wire.

For his services Peary received the medal of the Royal Geographical Society, and an admiral's commission from the United States Government.

In spite of the desolation that pervades polar regions, the resources are considerable and have attracted much commercial activity. For many years whale oil was about the only illuminating oil used by most of the world, and the chief supply was obtained from the whales slaughtered in north polar regions.

Holland sent whaling ships to the arctic as early as 1613, and for two centuries whaling fleets of different nations frequented these seas. During the early part of the seventeenth century—the most profitable period—upward of three hundred Dutch ships and fifteen thousand men annually visited Spitzbergen. It is estimated that in two centuries America, England, and Holland obtained from the arctic regions products amounting to one thousand million dollars, the greatest items by far being whale oil and whalebone. Great quantities of fossil ivory have been obtained from the New Siberian Island, the very soil of which seems in great part to be made up of the bones and tusks of the extinct mammoth.

Much valuable scientific information has been gained by meteorological and magnetic observations. The north magnetic pole, toward which the north-seeking end of the compass needle points, has been located on the west side of Boothia Peninsula. At this place the dipping needle stands vertical. It must be borne in mind that the north pole of the earth and the north magnetic pole are two entirely different points. As a matter of fact, if the mariner be in the arctic waters north of Boothia Peninsula his compass points south.

The arctic currents have been carefully studied with valuable results, and it has been found that the drift of the polar ice-floe is constantly to the eastward. Snow-white arctic reindeer in considerable numbers have been recently found; and Peary found seals within two hundred miles of

Musk ox

the north pole. The Greenland seal seems to enjoy seas filled with ice, spending part of the time in the water and part on the ice-floe.

It is now known that Greenland is an ice-capped island very sparsely inhabited along the coast by Eskimos. A few hundred of these hardy people live along the Greenland coast from Cape York up to latitude seventy-eight degrees, cut off by the surrounding ice-cap from the rest of the world. They are the most northern known inhabitants.

Peary found the northern coast of Greenland well stocked with both animal and vegetable life. Bears, wolves, hares, and musk oxen were seen in considerable numbers.

A most important fact discovered by Hall was that the most northerly part of Greenland is comparatively free from ice, the largest known area of bare ground of that continent. This fact accounts for the profusion of animal and vegetable life existing there.

One of the most interesting of land animals found in the north is the musk ox. When fully grown and in good condition this animal weighs five hundred pounds and upward. When the musk oxen are attacked by wolves or dogs they form themselves into a circle with their heads on the outside and conceal their calves under their bodies. Their hair, being long, reaches nearly to the ground and forms a curtain which completely conceals the calves from view. Their food is moss and lichens which grow on the rocks. This they obtain by scraping away the snow with their sharp hoofs. The flesh of the musk ox, though musk-like in flavor, is not repulsive to the taste, and several explorers have been saved from starving by using the flesh for food.

The chief obstacles to arctic exploration are the long winter night, during which all must remain idle, and the necessity for carrying all provisions. No one who has not wintered beyond the arctic circle can have a realization of the influence on the nerves of continual darkness for months, an influence that has driven many men insane. Combine the darkness with the weird scenery and the fierce storms that prevail during the long winter, and it requires a strong will and abiding faith not to be seriously influenced. The extreme cold is not hard to endure if one clothes himself in the manner of the Eskimos.

Provisions and supplies must be carried by dog sledges, and the management of the dog teams is very difficult for

those who have not been trained to the work. Shetland ponies have been tried as draught animals. Captain Evelyn Baldwin was the first to use them in polar exploration; others have used them, but less successfully.

Good coal is found in abundance on many of the islands of the arctic. Its outcroppings are found on Disco Island, west of Greenland, and excellent coal is found in many places in Spitzbergen, where at the present time two companies are mining it, one American and the other English.

Spitzbergen is sometimes called No Man's Land, since Norway and Sweden have not been able to agree in regard to its possession. Lately the islands of this archipelago have become favorite resorts for summer excursionists who can here have the arctic scenery and experiences with but very few discomforts. Ptarmigan, geese, ducks, and many other kinds of birds are found on these islands. Large quantities of eider-down have been obtained annually from this section, but the rapid destruction of the ducks by hunters has lessened the industry and will probably annihilate it. There being no law to regulate hunting, sportsmen wantonly kill the wild animals, especially the reindeer and bears, in great numbers.

We owe much to dogs in arctic explorations. It would have been impossible to penetrate to the interior of arctic lands or to traverse the frozen seas but for the services of the faithful dogs trained to draw sledges. Many of these animals have suffered from overwork and have perished from starvation; others have been sacrificed for food in dire extremities to preserve the lives of their masters. Surely arctic service has proved as destructive to the poor dogs as to men.

CHAPTER XII

POLAR REGIONS—ANTARCTICA

A CONTINENT twice the size of the United States lies sleeping beneath a mantle of snow and ice at the south pole. No vegetation save a few mosses and lichens exists anywhere on this vast expanse. No four-footed animals rove over it; no human beings inhabit it.

Hundreds of thousands of square miles of pack-ice, glaciers, and ice-walls jealously guard it on all sides. On one side, for a distance of five hundred miles, extends a great ice barrier whose perpendicular ice-wall is from thirty to three hundred feet in height. Behind this wall are vast ice-fields, and beyond these immense plateaus of ice having an elevation of six thousand to twelve thousand feet where fierce winds and a biting cold prevail. On these elevated plains the thermometer stands in the middle of summer sometimes as low as forty degrees below zero.

Great fields of ice and huge icebergs cover the sea in all directions and in winter extend far beyond the antarctic circle. In these regions the ice forming on the surface of the ocean attains a thickness varying from five to seventeen feet. Long ranges of snow-clad and ice-mailed mountains are found with ermined peaks towering from ten thousand to fifteen thousand feet in height.

A long winter night, with its intense darkness relieved at times by the light of the moon and brilliant chromatic displays of the aurora australis, succeeds a day of perpetual sunshine. All these are on such a scale of sublimity that no pen can adequately describe nor brush portray them. Nowhere else on the face of the globe does there exist such a wide expanse of utter desolation. Yet an undefined attraction lures bold men to fathom the mysteries of these forbid-

ding regions. Dating from 1772, many exploring expeditions have visited the south polar regions in the interests of science.

The compass is the mariner's guide across the trackless ocean, and it is essential to find out everything possible about that mysterious agent, magnetism, which directs the compass needle by its attractive force. The earth itself is a huge magnet with positive and negative poles. The poised needle of the compass maintains its relative position because of the magnetic poles of the earth, one located in the north polar regions, on the western side of the peninsula of Boothia, and the other in the south polar regions, on Victoria Land. Except in a few localities the compass needle does not point due north and south—that is, toward the real poles of the earth, but toward the magnetic poles. And these magnetic poles are ever shifting, as is shown by the changing direction of the compass needle, which year by year increases or decreases its deviation from true north and south.

It is necessary to chart the variations of the magnetic needle for the use of the navigator. To observe the deviations and to locate the south magnetic pole have been the chief objects of south polar expeditions for several years, geographical information being of secondary importance.

The marine life of the south polar regions is abundant. In the latter part of the eighteenth century ships sailing in the regions north of the antarctic circle discovered whales and fur-bearing seals. Soon sealers and whalers of different nations began to frequent the prolific new regions. Then various European nations and the United States sent out exploring expeditions to the south polar regions to gather scientific and geographical information as well as to assist the charting of coasts and the determination of magnetic variations.

On account of their uninhabitability, their difficulty of

access, and their unknown commercial value, the antarctic lands have claimed far less attention than the north polar regions. The famous explorer, Captain James Cook of the royal navy, was commissioned by the British Government

An antarctic summer scene

to undertake various exploring expeditions, and in carrying out his instructions he made several voyages to the antarctic. In 1773, with his two vessels, *Resolution* and *Adventure*, he crossed the antarctic circle—so far as is known, the first time that it had been crossed by a human being. He continued farther southward, but finding an alarming increase of pack-ice and icebergs, he soon retreated north. In January of the following year he succeeded after a third trial in reaching latitude 71° 10′ south, the farthest south attained during the century.

In 1839 an expedition was sent out by the United States Government under Captain Charles Wilkes. The exploring squadron consisted of five ships and more than four hundred officers and men, scientists, and crews. Wilkes was the first to discover the so-called mainland of the antarctic continent, in January, 1840. He then followed along this unknown coast-line amid icebergs, fogs, and storms for over fifteen hundred miles, taking such observations as were possible. For his polar achievements in discovery and exploration he was awarded a gold medal by the Royal Geographical Society. Considering that he was supplied with improperly equipped ships, he certainly accomplished wonders.

The British Government, realizing the necessity for better magnetic charts of the south polar regions, and urged by the scientific societies of England, sent out a second expedition to the antarctic under the command of Sir James Ross. The expedition sailed from England in the fall of 1839 in the *Erebus* and *Terror*, both of which were subsequently lost in the unfortunate Franklin expedition.[1] On this voyage Ross made many discoveries, the most important of which was Victoria Land. On this land is the south magnetic pole toward which the south-seeking end of the needle always points. Ross greatly desired to plant at the south magnetic pole the flag that had been displayed at the north magnetic pole in 1831, but he was unfortunately caught in the pack-ice and compelled to abandon the attempt.

Two volcanic mountains were discovered on an island near Victoria Land. These mountains Ross named Erebus and Terror from the two ships in which he sailed. The former, thirteen thousand feet in height, was in violent eruption, and the latter, ten thousand feet high, was quiescent.

[1] In April, 1831, Ross had the honor of fixing the location of the north magnetic pole on the Boothia Peninsula in latitude 70° 5′ north and longitude 96° 46′ west.

An expedition which has accomplished very great results in antarctic research was sent out under Captain Robert F. Scott of the British navy in the vessel *Discovery*. Through the influence of the Royal Geographical Society this expedition was admirably financed, the English Government and private parties contributing four hundred and fifty thousand dollars toward its equipment.

The *Discovery* left Cowes, England, in the summer of 1901, and, after making a series of magnetic observations south of Australia, steered for the south polar regions. Pack-ice was met almost at the antarctic circle, but Scott gradually worked the vessel through the pack and reached the base of Mount Terror where he landed a party. Then with the remainder of his men he coasted eastward along the great ice barrier for five hundred miles. It was found that the barrier had receded thirty miles since its front was examined by Ross in 1841 and that its front is wearing away at the rate of one-half mile a year. A captive balloon was used in making investigations of the ice front. If the unfortunate case of Andree be excepted, it was the first time that the balloon was used in polar research.

The vessel remained in a safe harbor near Mounts Terror and Erebus, where it lay frozen in for two winters. Every precaution was taken to insure the safety of the land party in case the ice should break up and force the ship out of the harbor. Suitable huts were erected on shore and a portion of the provisions was landed. Magnetic observations and other scientific work were carried on daily.

During the warmer season of the year many journeys were made into the interior. In order to be able to advance as far as possible, sledge journeys were made along a selected route to establish provision depots. This being done, Captain Scott with two companions and nineteen sledge dogs started for a protracted journey into the interior. They

travelled three hundred and fifty miles inland over the great ice-field but did not even then reach the end of it. Then, having lost most of the dogs, and the provisions being low, the party set out on their return to the ship.

The few remaining dogs being disabled, the men were obliged to haul the sledges. Having suffered great hardships, the party reached the vessel after an absence of three months.

On this journey a long range of mountains with many high peaks was discovered. The highest peak, fifteen thousand one hundred feet, was named Mount Markham. The latitude reached was 82° 17′ south, being the farthest distance south attained. On a subsequent journey a plateau of nine thousand feet elevation was reached, where the evenness of the ice surface for miles seemed scarcely broken. The length of this journey was three hundred miles.

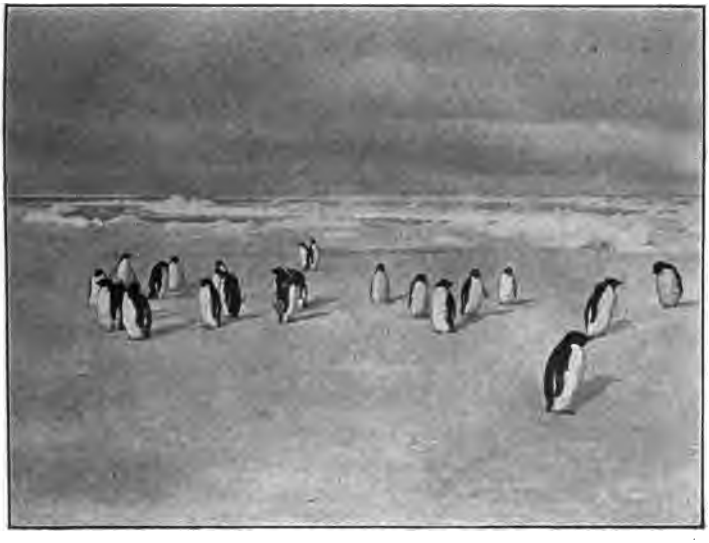
At the end of the second winter two relief ships appeared at the edge of the ice with orders that Captain Scott should return home at once. The *Discovery* was still sealed up in the harbor with solid ice from twelve to seventeen feet thick, and it was a problem how to free the vessel. The solid ice extended out more than six miles from the harbor.

The crews set resolutely to work making holes in the ice in a direct line from the imprisoned vessel to the open water. In these holes powerful explosives were placed which cracked the ice. This labor consumed some nine days. Then the great ocean swells broke up the ice, freeing the vessel. The *Discovery* forthwith sailed for England by way of Cape Horn, arriving home in September, having gathered much valuable information during her sojourn in the south polar regions.

Although practically no vegetable life has been found in these regions, an abundance of animal life exists in or contiguous to the sea, dependent on shrimps, fish, and such

other life as the sea affords. Seals, penguins, petrels, cormorants, and gulls are found in considerable numbers. In fact, no persons tarrying in these regions need starve for lack of food, such as it is.

During the two years spent by the *Discovery* in the south



The penguin defies the cold

polar ice, seals and penguins formed staple articles of the diet of the men. Though the flesh of both of these creatures has a strong and peculiar flavor, it was found to be an agreeable change from pemican and other preserved material. So vigorous were the men's appetites, stimulated by the excessive cold, that when they labored hard sometimes seven meals were served daily.

Because of the thick layer of fat covering their bodies, penguins were used as fuel when the coal began to give out.

Penguins are strange, interesting sea fowls having an inquisitive and fearless nature. At one of the rocky shore rookeries millions of these grotesque birds were seen.

The type of penguin found here is a very handsome bird, decked out in rather gay colors, having a jet black head, bluish-gray back and wings, a yellow breast and bright spot of orange on the neck, and an orange-colored lower bill. As though proud of his multicolored dress he walks with slow and majestic step. His height is about four feet and his average weight eighty-five pounds. He makes free use of his voice which is loud and shrill. Whenever a group of penguins see an object that excites their curiosity they will stand around it in a circle and gaze at it intently. Lieutenant Shackleton had a graphophone as a part of his equipment, and whenever it was used, during the season when penguins were about, they used to gather around the instrument by the hundreds, seeming to be quite as much interested as his human listeners.

When all other birds flee at the approach of the antarctic winter the eccentric penguin defies the cold and hatches its single egg in the dead of winter, with the thermometer ranging from eighteen to seventy degrees below zero. It does this by carrying the egg between its legs, resting it on the back of the foot while a fold of heavily feathered loose skin completely covers it up.

After the chick is hatched it takes the place of the egg and is carried around in this queer receptacle. When the chick wants food it utters a cry. Thereupon the parent bends its neck down, and the little one thrusts its head into the parental mouth to help itself to regurgitated food. The adult fowls of both sexes are fond of nursing the chickens and frequently quarrel over the possession of the little ones, often with fatal results to the younglings. Over half of the chicks die or are killed by kindness.

The expedition to the antarctic commanded by Lieutenant Ernest Shackleton must always be considered one of the most important among those fitted out for the work of polar research. Shackleton had been a member of the Scott expedition and therefore was well acquainted with the character of the work. The members of the staff, about twenty-five in number, were selected with great care, and the results of the expedition demonstrated Lieutenant Shackleton's wisdom.

The *Nimrod*, a wooden steamship built for seal hunting, was purchased and equipped for the expedition. She was a small vessel, scarcely more than one hundred feet in length. Her foremast carried square sails; her main and mizzen masts were schooner-rigged. Under steam her speed did not exceed six knots. The equipment included a generous outfit of scientific instruments, a supply of dogs and sledges, ten Manchurian or "Shetland" ponies, and a gasoline motor-car. The vessel was equipped at Cowes, England, but made her final start from Lyttleton, New Zealand, New Year's Day, 1908. In order to save her supply of coal for future use she was towed to the antarctic circle.

The following winter months, May to September, were spent on Ross Island, near the winter quarters of the *Discovery*, in McMurdo Bay, about thirty degrees south of New Zealand. This bay, or sound, forms a curve in the shore line of Victoria Land, the coast of which is the best known part of the antarctic regions. Up to the present time it is the most accessible entrance to south circumpolar regions known; it is also the most convenient location for winter quarters, being only two thousand miles from New Zealand.

In the following March a party of six—David, Mawson, Mackay, Adams, Marshall, and Brocklehurst—prepared for the ascent of Mount Erebus, the volcano, then active, discovered by Ross and named after one of his ships. The

crater rim was only a few miles distant, and during the first three days the party could be seen from the camp by means of a powerful telescope—tiny black specks struggling up the ice-clad slopes. Three craters were discovered, the youngest and highest of which was found to be thirteen thousand three hundred and fifty feet above sea level.[1] During the ascent the party nearly perished in a gale which blew their tents into tatters. The crater rampart was finally reached, however, and a number of excellent photographs were made.

During the entire stay at Ross Island the steam column from the crater furnished the means whereby the direction of the upper currents of air might be instantly noted, and the condition of activity did not differ materially from that observed in Stromboli. When the barometer was low the steam column was heavier and denser; the glow of light was also brighter. With a high barometer, on the contrary, the conditions were reversed, the steam column was insignificant and the glow was scarcely visible. As a rule, the ascending column of steam was projected three thousand feet or more before it was caught by the upper air current. Measurements showed the principal crater to be half a mile in diameter and nine hundred feet deep. Great deposits of sulphur and pumice were observed.

In the last week of October a party composed of Shackleton, Adams, Marshall, and Wild started on the trip to discover the south pole. The journey to the point farthest south occupied seventy-three days. After a few days out from the winter quarters no bare rock was seen—the landscape being one of ice and snow.

[1] According to the observations of Ross its altitude was twelve thousand three hundred and sixty-seven feet. Inasmuch as a change in altitude results from each eruption, both determinations may be correct. The admiralty charts give twelve thousand nine hundred and twenty-two feet, the determination of the expedition of 1901.

Shackleton's journal of January 8 notes the fierce gales blowing at the rate of seventy or eighty miles an hour, while the temperature had dropped to "seventy-two degrees of frost." "We are short of fuel," he writes, "and at this high altitude, eleven thousand six hundred feet, it is hard to keep any warmth in our bodies between the scanty meals. We have nothing to read now, having left behind our little books to save weight, and it is dreary work lying in the tent with nothing to read, and too cold to write much in the diary."

"It (January 9, 1909) is our last day outward. We have shot our bolt and the tale of latitude is 88° 23′ south. We hoisted her majesty's flag, and the other Union Jack afterward, and took possession of the plateau in the name of his majesty. While the Union Jack blew out stiffly in the icy gale that cut us to the bone we looked south with powerful glasses, but could see nothing but the dead white snow-plain. There was no break in the plateau as it extended toward the pole, and we felt sure that the goal we have failed to reach lies on this plain. We stayed only a few minutes, and then taking the queen's flag, and eating our scanty meal as we went, hurried back and reached our camp about 3 P. M. Whatever regrets may be, we have done our best." On their return journey the party killed the two surviving ponies for food.

Early in October, 1908, a party consisting of David, Mawson, and Mackay started on their journey to locate the south magnetic pole. Like the journey of the southern party, it was a trip of hardship, intense cold, and physical suffering. On January 16, 1909, partly by experiment and partly by calculation, the point of vertical position of the needle was found in latitude 72° 25′ south, longitude 155° 16′ east. The position found by Professor David was very close to that obtained by Scott of the *Discovery* expedition and about

forty miles from that which Ross calculated in 1841. In the interval of nearly seventy years, it is safe to assume that the position of the south magnetic pole has shifted forty miles.

In spite of the knowledge obtained in other directions, Shackleton frankly admits that the secret of the great ice barrier cannot be learned until the structure and trend of the mountain ranges which seem to form its edge are traced. The investigations showed, however, that it is composed of densely packed snow. It was found that at least one part of the ice barrier is receding, and that Balloon Bight, noted by Captain Scott, had disappeared in consequence of the recession. Not the least important part of the exploration was the discovery of forty-five miles of coast. Shackleton also was able to strengthen the opinion that Emerald, Nimrod, and Dougherty Islands do not exist.

The hardy Shetland and Manchurian ponies, first used by Evelyn Baldwin, proved a valuable equipment in polar research. Shackleton's gasoline motor-car and Scott's captive balloon were of considerable but limited use.

During 1910 and 1911 three different nations—England, Norway, and Japan—were represented by expeditions in south polar regions. The Norwegian expedition under Captain Roald Amundsen was especially equipped for quick travel, having eight sledges and more than one hundred trained dogs.

The expedition made its way to the head of Ross Sea, a large bay of the Antarctic plateau, nearly due south of New Zealand. The camp there was made the base of supplies. Depots for provisions were first established in latitudes 80°, 81°, and 82°.

A start for the pole was made September 8 with eight men, seven sledges, and ninety dogs. The weather was too severe for the dogs, however, and the party returned to camp. By the middle of October summer weather had set

in, and on the 20th of the month five men, four sledges, and fifty-two dogs started on the poleward trip. Three days later they reached and passed the first depot; on the 31st the second depot was reached; and on November 5 the sledges reached the third depot in latitude 82°. Additional supplies were thereafter cached, in depots about one degree apart, to be used on the return trip. Snow cairns were built at frequent intervals to mark the trail. The last cache of supplies was left at latitude 85°.

From this point the way was a steep and difficult climbing over the range, or barrier, that had proved so difficult for Shackleton. Peaks in height from ten thousand to fifteen thousand feet loomed up on every side, and glacier surfaces proved to be the easiest paths.

When a height of nine thousand feet had been reached the rugged upraise opened out into a nearly level plateau. On December 10 observations showed latitude 89°, and on the 14th of the month the party reached latitude 90° and achieved the conquest of the South Pole. The Norwegian flag was planted, and after three days spent in checking observations the party returned in safety. The expedition returned by way of Tasmania. The vessel employed was the *Fram*, the small steamship used by Nansen.

Captain Scott, who commanded the *Discovery* in the expedition of 1901, went with the men in his command to Ross Sea and made his head-quarters near the head of that body of water. He at once sent out exploring parties, one of which started for the pole. According to reports made in April, 1912, he had accomplished a great deal of work in surveys and geological research, probably more than all that of his predecessors.

The same reports brought also word that the Japanese expedition under Lieutenant Shirase had surveyed a considerable extent of the Antarctic coast.

CHAPTER XIII

ICELAND, THE MAID OF THE NORTH

SEVERAL thousand years ago a mighty conflict occurred between the sea and the subterranean forces in the north Atlantic five hundred miles northwest of Scotland. A violent earthquake rent the rocks of the ocean bed, and through the broken floor there issued tremendous floods of molten lava. The great conflict manifested itself in explosions of steam, gigantic streams of red-hot lava, frothy pumice, and volcanic ashes. For miles around the water of the sea was seething and boiling.

After awhile the turbulence of the fiery mass was subdued and it stood congealed in the varied forms of rugged peaks, contorted ridges, and deep valleys, subsequently to be seamed and further distorted by earthquakes and piled higher by further volcanic outbursts. A new island had been born.

Ages rolled on; vegetation appeared as the volcanic rock disintegrated; crystal lakes were formed and rivers, fed by frequent rains and melting snows, flowed to the sea. This comparatively new island is Iceland. The book of nature here is open; the print is clear; and the language is so plain that he who can read may learn the story.

The internal fires of the earth seem to have taken their final great stand in this far-off northern land and have waged a titanic battle to the death, as may be seen in many places. In the northern part of the island one may find acres of burning sulphur beds, small geysers, and mud caldrons, all of which attest to the slowly dying volcanic forces beneath. Although a comparative calm now exists,

an exciting cause may at any time awaken the slumbering volcanoes and again renew the work of destruction.

Fossilized forests are found, but of trees different from those now existing. Climate and vegetation materially changed as century succeeded century.

The written history of Iceland begins about the year 860, when a viking living on the Faroe Islands who was on his way home from Norway, being driven far northward of his course, came to an unknown coast. Climbing a high rock and looking around, he beheld no signs of life; before he could return to his ship, however, a sudden storm came on, covering the ground with a mantle of snow. From the latter circumstance he named the country Snowland.

Four years after a Swedish master-mariner was driven by stress of storm to this same land, and, building a house, spent the winter there. During the following summer he sailed around the land, demonstrating that it was an island, and called it after his own name, Gardar's Island. On his return home he gave such a favorable account of the island that a famous Norwegian viking named Floki determined to seek it and to take possession. Having gathered his family and followers, and taking on board some live stock, he set sail for the unknown land by way of the Faroe Islands.

The compass had not then been invented, but knowing that ravens by instinct seek the nearest land when freed on the ocean, he provided himself with three of these birds to serve as guides.

He remained awhile at the Faroe Islands and then boldly sailed northward. When he was several days out he uncaged one of the ravens, which immediately took its flight back to the Faroe Islands. Later, he set free a second bird. This one, after hovering high in the air for some time, seemed bewildered and returned to the ship. Still later, the third

raven was set free, which at once flew northward. By pursuing the course taken by the last bird, Floki soon reached the desired land.

The winter that followed was very severe. Deep snows covered hill, rock, and valley, and ice blockaded the fiord. Floki had neglected to harvest the wild grass, and as a result his cattle died. Disheartened by his losses, he returned to his native land, naming the island which he abandoned Iceland.

A few years later another Norse rover, who had slain an enemy and was threatened with vengeance by the relatives of the victim, took refuge on the island where he spent a year. He liked the country so well that he returned home and induced his retainers to accompany him back to his safe retreat. Approaching the land, he threw into the sea the sacred columns which his vessel bore, so that he might learn the will of the gods where to land and found a colony. A violent storm arising, the pillars drifted out of sight, so he sought the nearest harbor and there he established a temporary camp.

Three years afterward the pillars were found on the desolate shore of a lava stream on the west side of the island. Near by was a rivulet from whose bed a spring gushed forth emitting clouds of steam. Thither the colony removed and the present capital, Reykjavik, was founded. The name Reykjavik means "smoking bay." Other vikings followed and selected such parts of the island as they considered best.

Harold, the king of Norway at this time, determined to curb the rebellious spirit of the chiefs under him. So, many of the sturdy Norsemen, chafing under his arbitrary rule, collected such of their property as they could carry and, putting it on board their stanch vessels, sailed away to the land of refuge.

At this period of history nearly all nations considered that

might made right; but no class of plunderers excelled the Norsemen, who were wont to make periodical raids on the various seaport cities and towns of Europe. They swooped upon them, pillaging and killing the inhabitants, and then

Street in Reykjavik, Iceland

fled in their swift vessels with booty and captives before they could be intercepted. The audacity of the Norse vikings knew no bounds. They pillaged Paris, Bordeaux, Orleans, and nearly every other city of France accessible by water. Their hands fell heavily on the coasts of Spain and the British Isles.

At one time a band of these fearless sea-robbers made their lairs in the Shetland and Orkney Islands and even plundered

the coast of Norway, the abode of their kinsmen. Their conduct so exasperated Harold that he determined to destroy the freebooters of the Orkneys root and branch. Gathering a large fleet, he relentlessly pursued the raiders up every bay and inlet. Leaving the ships, he chased them among the rocky islands and the sinuous fiords. When they were overtaken the pursuers showed them no mercy. A few escaped, and, stealing away under the cover of darkness, the hunted sea-robbers fled in their ships to Iceland.

All the while the tide of immigration was augmented by the migrations of disaffected nobles from Norway. This naked volcanic island had more attraction for them than their own country where freedom was denied them.

Sixty years after the first settlement fifty thousand people had made their homes in Iceland. The inhabited parts were along the coast, in the river valleys, and in the vicinity of the fiords, rarely extending farther than fifty miles inland.

In order to better maintain rights and settle disputes, in 930 the chiefs or nobles established an aristocratic republic and adopted a constitution. The republic existed four hundred years. Many just laws were enacted, some of which England was glad to borrow. The legislative meetings were held in Thingvalla, a picturesque valley thirty-five miles east of Reykjavik. This valley was formed by the sinking of a lava area of fifty square miles. In the middle of the valley, flanked by two huge jagged walls of lava, is a triangular floor of lava like a large flatiron having separating chasms meeting at the apex. Here the Althing, or general assembly, met annually to make laws and settle disputes. Toward the south the valley slopes gently to Thingvalla Vatn, a beautiful sheet of water of crystal clearness ten miles long and five miles wide, having in some places a depth of a thousand feet. The scenery here

is one of rugged beauty and surpassing grandeur. Hard by, a river comes tumbling over its rocky bed, then calmly pours its icy water into the placid lake. No spot is better suited to inspire freedom of thought and lofty imagination than this primitive meeting-place of a legislative assembly.

Eventually, Iceland became subject to Norway and afterward a colony of Denmark, which it remains to-day. Self-government and the re-establishment of the old Parliament at Reykjavik was granted by Denmark in 1874.

Iceland is not only out of debt but has the snug sum of one million crowns in its exchequer. It is an ideal place for the woman's rights advocates, since women here have the right to vote and do not change their names when they marry.

Although the island contains forty thousand square miles, five-sixths of it is uninhabitable. The present population is eighty thousand.

It may with truth be called naked because it is only partly clothed with vegetation; moreover, such vegetation as exists is scanty and confined chiefly to the river valleys and their slopes. In the interior are large desert areas covered with lava and shifting sand. This desolate expanse is frequently diversified by extensive jokulls, or elevated ice-fields, one of which occupies four thousand square miles.

Strange as it may seem, the winters in the inhabited sections are not so severe as those of New England, owing to the modifying influence of the warm southwesterly wind and the mild temperature of the surrounding waters. The summers are cool, owing to the nearness of the arctic ice-fields. In the interior on the table-land one is apt to encounter snowstorms even in August.

The only wild animal is the fox, of which there are two varieties, the white and the blue. These animals probably

drifted on the ice from Greenland. They are hunted not only for their skins but also because they attack the sheep.

The domestic animals are horses, cattle, sheep, dogs, and cats. The horses and cattle are small. The ewes, instead of the cows, are milked. Iceland ponies are famous for their hardiness and are surefooted. Large numbers of them are exported to England for service in the coal-mines. There they are condemned to hard labor for life in the dark galleries.

Iceland ranks second among the geyser regions of the world, Yellowstone Park being first. The boiling springs and geysers are not confined to one locality but are scattered widely over the island. The most prominent are east of Reykjavik.

According to its area probably no other part of the world except the island of Java has so many volcanoes. More than one hundred craters and cinder cones have been counted, many of which have been active within the historical period of the island. The most destructive volcanic eruption took place in June, 1783. The spring had opened auspiciously; the cattle, sheep, and horses were cropping the juicy young grass; and the air was balmier than usual. In the latter part of May a bluish smoke accompanied by earthquakes began to spread over the land. As time passed the earthquake shocks increased in violence. The surface of the earth heaved like the ground swell of the ocean after a storm; the atmosphere became filled with choking vapors and blinding smoke; the sun was darkened and the low rumbling sounds became heavy peals of thunder. Presently two mighty streams of lava, one of which was fifteen miles wide and one hundred feet deep, came pouring down the sides of Skaptar Jokull. The lava floods filled up the valleys, quenched rivers, and spread destruction over the adjacent country. The intense heat blasted the vege-

tation far and wide. Nine thousand people and fifty thousand head of live stock were the result of the death harvest.

Iceland is well watered, having many streams, all of which are rapid, for the greater part flowing over beds of lava and quicksand. In some of the wider fords stakes

North Cape, Iceland

have been set so that the traveller may not get lost in crossing them on horseback during a dense fog. In the summer the frequent rains make travelling very unpleasant unless one is suitably equipped with water-proof garments. In the Hvita, or White River, is the celebrated Gullfoss —literally, "goldfall"—a fall that rivals Niagara in the height of its two cataracts.

A few garden vegetables excepted, little or no agriculture

is attempted; the chief dependence of the people is the rearing of sheep, cattle, and horses, fishing, and the collecting of eider-down. The streams are filled with excellent fish, including the salmon; off the coast are codfishing grounds equal to, if not surpassing, those of Newfoundland.

The most valuable mineral is sulphur, the supply of which appears to be inexhaustible. The chief exports are wool, oil, fish, horses, eider-down, knit goods, sulphur, and Iceland moss.

Transparent calcite, a mineral commonly called "Iceland spar," is found, one mine of which furnishes an excellent quality. It is highly prized by mineralogists on account of its double refractive qualities. If a piece of this mineral be placed over a word, the letters forming it will appear double. Iceland spar is used chiefly in the optical instrument known as the polariscope.

Eider-down consists of the soft, fine feathers growing on the breast of the eider-duck, great numbers of which frequent the coast and lakes of Iceland. This duck is wild except at the nesting season; then it is as tame as the domestic fowl and makes its nest not only around and on top of the buildings but frequently inside them. A heavy fine is imposed on any one killing a duck at this season.

When about to lay, the duck carefully lines her nest with down plucked from her breast. Then people remove it from the nest and the duck pulls more down from her breast to replace that taken. This process is repeated several times. When the duck has stripped her own breast the drake comes to the rescue and furnishes down from his. A certain number of the eggs are also taken. These, though inferior to those of the swan, are esteemed a great delicacy. Swans also are killed on many of the lakes.

Iceland is the resort of the fishing fleets of several nations; the value of the annual catch averages about ten

million dollars. Much of the catch consists of food fish, but many are caught for the oil.

The only trees found growing on the island are birch and ash, and they seldom exceed ten feet in height. A few juniper bushes and willows are found here and there.

In the remote and isolated sections most of the dwellings are built of blocks of lava laid one upon another, making a wall six feet thick. Upon these are placed rafters made from ribs of whales, driftwood, or anything else that will answer the purpose. The roof is then covered with grass and turf. In the hamlets many of the houses are constructed of imported lumber, there being no trees of sufficient size on the island for building purposes.

The inhabitants are very hospitable and every house is open to the traveller. They live in a simple manner, drink sour whey and milk, eat rancid butter, fish, mutton, and occasionally the lichens called Iceland moss. When well cooked, the last named is quite palatable. It is also a sovereign remedy for bronchial ailments.

Notwithstanding their many privations, the people are loyal to their country and lovingly call it "The Maid of the North." They lead pastoral lives and their customs are much like those of the Homeric age. Story-telling is much appreciated by all classes. There are wandering minstrels who gain their livelihood by going from house to house to recite the stories in prose and poetry which they have learned by heart. Spindle and distaff are used in spinning the wool into yarn, which is then knit or woven into cloth on a hand loom.

Education is universal, and no child of twelve years can be found who is unable to read or write. The families are so isolated that there are few schools outside of the capital; but the parents diligently teach their children whatever they themselves have learned.

During the long winter evenings one member of the family reads aloud while the others are busily at work, the men making nets and ropes, or removing the wool from the sheepskins, the women embroidering, sewing, or using spindle and distaff.

In no other country of Europe are so many books and papers published in proportion to the population as in Iceland. On the average one hundred books are issued annually from Icelandic presses. Several excellent newspapers and periodicals are also published.

Every Icelander to-day knows perfectly the sagas, the legendary stories that commemorate heroes and heroic deeds and which are so dear to his heart. It is not uncommon to find an Icelander who is well versed in the ancient classics or one who can speak several languages. They are well acquainted with the writings of Milton and Shakespeare, which have been translated into their own language. During the twelfth and thirteenth centuries Iceland produced a literature equal to that of any other nation in Europe within the same period.

CHAPTER XIV

GREENLAND

THE history of Greenland really begins about the year 986 A. D., when Eric the Red, a chieftain who had been banished from Iceland, landed on the island with some of his followers and made it his permanent residence. At different times these hardy and daring seamen made expeditions to the eastern coast of North America, and sailed as far south as Chesapeake Bay. They attempted to found a colony on the east coast at a point thought to be on the

coast of New Jersey but, after contending with the savages for some time, deemed it best to abandon the project and to return to their Greenland home. The location at which they attempted their colony is by no means certain.

All this island, a half million square miles in area, except a small part of the southern coast line and a larger

Stone igloos on the bleak coast of Greenland

area in the north, is covered by an immense glacier. And this field of ice, like a huge piece of plastic wax, is constantly moving from the interior down toward the sea. As it approaches the ocean it divides into branches which flow down the numerous fiords and valleys into the sea. As the fronts of the branch glaciers are pushed out into the water their ends are broken off by the buoyancy of the water. These glacial-born masses then float away as icebergs, carrying with them on their southward journeys the

rock waste—moraine detritus it is called—gathered by the parent glaciers.

When these floating leviathans are off the coast of Newfoundland, they encounter the waters of the Gulf Stream, melt, and scatter their debris of stony matter over a large area of the ocean bed. This process, having gone on for thousands of years, has shoaled the ocean in certain parts, forming the so-called Banks of Newfoundland.

A gelatinous slime filled with minute animal life forms on the bottom of the ocean in the arctic; the cold currents flowing south carry some of it along with them, and much of it is lodged on the stony bottoms of these banks. Fish, especially the cod, are fond of this gelatinous substance, and throng thither at certain seasons of the year in countless numbers to feed upon it.

One ignorant of the currents of the ocean might be puzzled at times in observing that an iceberg floats southward at the same time that pieces of wood are floating northward, both apparently acted upon by the same current. This may be explained by recalling that warm water is lighter than cold and hence is found as the upper layer when a cold and a warm current are flowing in different directions, one upon the other. It should be borne in mind that seven-eighths of the floating iceberg is under water, leaving but one-eighth above the surface. The Gulf Stream drift spreads out as it travels northward, and, being much shallower than the arctic currents, carries floating objects northward on the surface, while the deeper and more powerful arctic currents force the huge masses of ice southward.

When the warm air over the Gulf Stream comes in contact with the floating ice it is chilled, and the moisture which it holds is condensed into fog. The fogs in turn, which are off the Newfoundland coast, being in the line of steamship communication between Europe and America, are a constant

menace to navigation. The near presence of ice is usually detected by a greater chilliness in the air. In order to avoid collisions with one another, and also with icebergs, a ship constantly sounds its sirens and fog horns as warnings while in the fog belt. The signal of another steamship is a warning of the one; the answering echo announces the nearness of the other.

A large iceberg

The high interior of Greenland, about ten thousand feet in altitude, is thought to result largely from the accumulation of ages of snow and ice, only a part of which melts or moves oceanward to form glaciers. No other part of the world is such an absolute desert as the greater part of this island. Animal and vegetable life are wholly absent.

The colony which was planted in Greenland by Eric the Red, and subsequently augmented by other Norsemen, continued to prosper for four hundred years. At the end of that period there were about two hundred villages, twelve parishes, and two monasteries. These, however, disappeared. The hostility of the Eskimos in part accounts for

their extinction, but an encroachment of ice from the north, which encompassed the southern part of the island, is thought to have been also a factor. The fact that foreign trade with Greenland was forbidden by the mother country may account in part for the gradual disappearance of the

A group of Eskimos in south Greenland

colony. At all events, intercourse with Europe seems to have been cut off. This condition continued for upward of two centuries, and when intercourse with the mother country was again possible there was no Greenland colony. Perhaps the finding of "white" Eskimo in Victoria Land may explain this disappearance.

Subsequently the island was again colonized, but con-

cerning the disappearance of the former inhabitants history is silent. The mute testimony of a few ruined buildings and relics is all that has been found to give the least shadow of information as to the final struggle of the wretched colonists. We only know that they mysteriously disappeared. But the great glacial cap is slowly receding and ages hence more ground will be laid bare.

The present inhabitants number about ten thousand, most of whom are Eskimos. They are lacking in thrift and live chiefly by hunting and fishing. Among the wild animals living here are the arctic fox, the arctic hare, the musk ox, the seal, the polar bear, the ermine, and the walrus.

The principal resources of the island are sealskins, eiderdown, oil, and cryolite.

Cryolite is a mineral from which common soda is easily extracted, and also from which the light silver-like aluminum was formerly prepared. The mines near the village of Ivigtut furnish practically the world's supply of this mineral. Formerly it was carried to Philadelphia, but in recent years not much is used. The fisheries are a monopoly of Denmark, and each station is visited from one to three or four times a year.

CHAPTER XV

WHERE THE TWO GREAT OCEANS MEET

PERHAPS there is no section of the globe about which most well-informed persons know so little as the southern part of South America. Judged by the reports of early discoverers and explorers, this region until recently has been considered a desolate stretch of snow mountains, barren plains, and extensive morasses, sparsely inhabited by a few

thousand human beings of the lowest type and worthless to civilized man.

Such a picture is but partly true. Many of the highest mountains are snow-capped throughout the year and are scored by immense glaciers which are constantly moving down their grooved sides; but there are also heavily forested slopes flanked by valleys and plains covered with rich grasses, making most excellent pasturage. The best land, comprising a large area, is now occupied as grazing grounds principally by sheep farmers.

In the early part of the sixteenth century it was rumored that a water passage traversed the southern part of South America. This rumor was proved true in 1520, when Ferdinand Magellan, a Portuguese navigator in the service of Charles V of Spain, sailed through the strait which now bears his name. He called the passage Todos los Santos—literally, "All Saints"—but later the name was changed to commemorate the bold captain who discovered the route.

Magellan was the first not only to sail through the strait, but to cross the broad Pacific Ocean, which was so named by him on account of the quietness of its waters. Because he saw the fires built by the natives blazing on the islands along the south side of the channel, he called them Tierra del Fuego, meaning "Land of Fire."

The Strait of Magellan varies from three to seventy miles in width. The scenery along its shores, low and treeless in the eastern part, elsewhere is mountainous and heavily wooded—mainly with beech. In various places lofty precipices rise abruptly from the water's edge; throughout most of its extent the shore line is rock-bound and studded with islets.

A more picturesque route, and one abounding in the grandest and most stupendous scenery in the world, is that from the Pacific by way of Smyth Channel, the entrance to

which is four hundred miles north of the entrance to Magellan Strait. By this route one follows a series of channels and reaches the strait proper near Desolation Island. On account of the dangers besetting this course, underwriters refuse to insure vessels taking it.

It remained for a Hollander named Schouten to discover Cape Horn, in 1616, and thus find a safer way for sailing

The Straits of Magellan. Cape Pilar is the extreme western end

vessels going from the one great ocean to the other. Schouten named the cape "Hoorn," from his native city in Holland. Afterward the name was shortened to Horn, which is applied both to the cape and to the island from which it projects. Since the western entrance to the strait is subject to rough, tempestuous weather and strong currents, very few modern sailing vessels take the shorter course, preferring to double the cape. Though doubling the cape is the safer route, yet this passage itself is beset by dangerous storms and tempestuous seas. Fortunate is the sailing master who rounds the Horn with pleasant weather.

Some of the smaller islands of the archipelago are densely wooded and practically unexplored. Gold has been found on the beaches of several of the islands in paying quantities, and these placers have been worked successfully for several years. On the islands are found wild strawberries of great size and fine flavor, wild raspberries, gooseberries, grapes, and celery; in the spring the pastures are covered with a variety of wild flowers. A profusion of ferns is seen almost everywhere. Wild geese and swans are found on the lagoons and lakes in large numbers.

Once upon a time Patagonia, as the southern part of the continent is popularly called, was regarded as a waste; now it is recognized as a wonderfully fertile region, and is being rapidly settled. European colonies have been established there, and they are highly prosperous. The native Indians are disappearing, hurried to extinction chiefly by King Alcohol, which, once tasted, seems to conquer them. Traders know the weakness of these savages, and exploit it for all they are worth. The articles which the Indians chiefly barter are skins, pelts, and ostrich feathers.

The Indians are well supplied with horses, the descendants of those brought to South America by Spanish explorers. They are wonderful riders and excel in the use of a peculiar lasso called the bolas. It consists usually of three balls of stone or metal covered with rawhide and attached to one another by twisted thongs of the same material. In fighting as well as in capturing wild animals, this instrument is indispensable. The operator, holding one of the balls, swings the others over his head and when sufficient momentum has been obtained lets them go. If well aimed, the connected balls circle around the legs of the animal to be caught, entangling and throwing it down.

The Indians of the mainland are strong and tall. Unlike most South American Indians, they go about well

clothed. Occasionally they kill their horses for food, but their chief reliance for both food and clothing is the guanaco.

Although the Indians have inhabited this part of South America for centuries, they follow well-beaten trails. They

Fuegians

live in a superstitious dread of evil spirits, who they believe dwell in the densely wooded mountain slopes of the Cordillera.

The Indians of Tierra del Fuego archipelago are much inferior to those of the mainland. They go almost or entirely naked and subsist on fish. The canoe Indians, as

those in the western part are called, build boats of bark sewn together with sinews. The boats are about fifteen feet long, and in the centre a quantity of earth is carried, upon which a fire is built. The canoe Indians have neither chief nor tribal relations; each family is a law unto itself. They spend most of their time during the day in rowing among the different channels where fish may be obtained. At night they generally go on shore to sleep. A hole scooped out of the ground or a sheltered rock with a few boughs bent down suffices for a house where all can huddle close together for warmth. Seldom do they sleep more than one night in a place, fearing that if they do not move on an evil spirit will catch them.

In the eastern part of Tierra del Fuego and on some of the other larger islands two tribes of Indians are found whose subsistence consists of sea food, guanacos, and such sheep as they can steal. These tribes are continually at enmity with the white settlers and will kill them whenever possible.

In spite of cloudy weather and cold winds, which are common a part of the year, the climate of Patagonia is milder than that of places much farther north, and the sheep require no feeding during the winter season. In the matter of sheep farms this section rivals Australia, since there is no fear of drought. The grass continues green the year around, and the sheep easily fatten upon it.

The drawbacks to successful sheep-growing are many and the business requires constant vigilance. Vultures, foxes, wild dogs, pumas, and Indians make serious inroads on the flocks. The wild dogs live in the surrounding forests and from time to time rush out in packs of from ten to thirty and attack the sheep. Notwithstanding all these troubles, however, the profits of sheep-growing are large.

Russians, Germans, French, Australians, English, and

Scotch, many of whom have amassed large fortunes in a few years, are engaged in this lucrative business. As in all other sheep-raising countries, the collie is an invaluable aid to the shepherds. Not only are the principal islands chiefly devoted to sheep-raising, but a considerable part of the southern mainland is also devoted to this industry. On the island of Tierra del Fuego alone there are upward of a million sheep.

Most of the land is leased from the government for a long term of years. Many of the proprietors have enclosed their holdings with wire fences, thereby lessening the expense of caring for their flocks. Some of the holdings range from twenty-five thousand to more than two million acres.

Southern Patagonia has immense numbers of guanacos, or wild llamas. These animals frequent the Andean slopes and the adjacent pampas. During the winter season they come down to the lowlands to drink in the unfrozen lakes and feed upon the herbage. During severe winters sometimes hundreds are found dead from starvation in the valleys near the frozen lakes.

Thousands of wild cattle are found on the eastern slopes of the Andes, but they are difficult to capture; they are exceedingly wary and can scent a man far off. In agility in climbing the steep, rough places they equal the goat. If one of their number is killed the whole herd deserts the locality at night. When wounded they are fierce fighters, if forced into close quarters.

Punta Arenas, or "Sandy Point," is on the north side of the Strait of Magellan and is Chilean territory. It is a new town cut out of the woods, and even yet many of the streets are diversified by the stumps of big beech trees. The place is an important coaling and provision station and, next to Honolulu, the most important ocean post-office in the world. It has a population of twelve thou-

sand, and is the capital and centre of the great wool industry of the Territory of Magellan, which comprises a majority of the islands south of the mainland, together with the southern part of Patagonia.

A few years ago, in order to encourage the building up of Punta Arenas, the government offered a lot free to any one who would erect a building on it. Many accepted the offer, and to-day some of the lots in the business part of the town are very valuable. Although most of the buildings are constructed with regard to economy rather than beauty, yet some of the business blocks will compare favorably with those of the new cities in the United States.

Like several Australian cities, Punta Arenas was a convict colony. It was founded as such in 1843, and so remained until the European steamships began to thread the strait instead of doubling the Horn. Then it became a coaling station, a supply store, a half-way town, and an ocean post-office. All this business was previously carried on at the Falkland Islands, but the route through the strait settled the business for both places. The Falkland station was abandoned; Punta Arenas became a thriving town. A ticket-of-leave was given to each convict who consented to join the Chilean army.

The town forthwith blossomed into a typical frontier settlement—banks and gambling dens, churches and saloons, schools and bullfights. Every race of people and almost every industry is represented there. The Spanish see to it that the Sunday bullfights are correct; the French insure the proper social functions; the Germans manage the banks; and the Americans take the profits of the railways, telegraph lines, and flour-mills. As to latitude, Punta Arenas is cold and inhospitable; but for business and social affairs, it is very, very warm, especially in the matter of social affairs.

CHAPTER XVI

RECLAIMABLE SWAMP REGIONS

If only Dame Nature had distributed the rainfall of the United States a bit more evenly, land enough to feed about fifty millions of people would not have required an expenditure of half a century of time and several hundred millions of good, hard dollars. One must bear in mind, however, that if Dame Nature had done otherwise, it is just as likely that the same time and the same amount of money would have been required elsewhere for those same fifty millions of people.

The reclaimable swamp lands of the United States east of the Rocky Mountains aggregate about one hundred and twenty thousand square miles in extent—an area nearly equal to that of Ohio, Indiana, and Illinois combined. Of this, Louisiana has about fifteen thousand square miles, a tract about as large as Massachusetts, Rhode Island, and Connecticut combined, and Florida has about half her entire area in swamp land. West of the Rocky Mountains, California takes the lead, with enough swamp land to make a state of respectable size.

In the case of California, if the "forty-niners" could have waited about a thousand years they would have found the precious swamp lands all properly filled in for them and ready for use; for the Sacramento and San Joaquin Rivers long since have been working at the task of filling up the big hollow between the mountain ranges. But the rivers are a trifle slow, and Californians are always in a steaming hurry. So Uncle Sam's engineers are driving their reclamation schemes with railroad speed. A few years ago these

lands were worth nothing; drain them and they are worth one hundred dollars per acre; improve them according to modern farming science and they are worth ten times as much.

In many instances even the quick methods of the reclamation authorities are too slow for the California farmer, and

The Everglades of Florida

so he takes matters into his own hands. First he acquires his land; then he mortgages all his worldly possessions to surround the land with a ditch deep enough and wide enough to make a dike high enough to keep out flood waters. His land after draining is full of the stuff for which he otherwise would pay thousands and thousands of dollars. Phosphates and lime form the coverings of minute swamp life and nitrogen compounds are a part of their bodies. The polders of Holland are not richer than this swamp land;

indeed, they are not so rich. One or two crops will pretty nearly extinguish the mortgage and three or four more will put the owner on "Easy Street."

In the bottom-lands of the Sacramento River is an island that for fifty years went a-begging. Then a company with a shrewd head bought it, diked it, and drained it. Now the island has immense celery beds and the largest asparagus farm in the world. The celery and canned asparagus are shipped to the produce markets of New York City.

Another great swamp area covers a large part of Louisiana, Mississippi, and Arkansas. This swamp was made when the head of the Gulf of Mexico reached half-way up to St. Louis, for the delta of the Mississippi River has been travelling leisurely southward for several thousand years—so leisurely, in fact, that Iberville and Bienville opened the region to settlement fifteen hundred years or more too soon. But Uncle Sam is taking a hand here likewise, and in another fifty years a population half as large as that of New York may not only live comfortably but get rich on the reclaimed lands of this and adjacent coast swamps.

The Carolinas, Georgia, and Virginia all have large areas of coast marshes—"pocosons" they call them—only a small part of which has been reclaimed. Formerly these were the property of the general government; then they were given to the States with the understanding that they were to be reclaimed. Large tracts were sold to speculators for a few cents an acre, and there you are! Few States are rich enough to handle extensive reclamation enterprises, and so the general government stepped in again and assumed the responsibility. That means that the work of reclamation will be skilfully and honestly done. Uncle Sam may play some questionable politics, but he never mixes politics and government business.

Of all the swamp lands of the United States, the region

in Florida known as the Everglades is the most interesting and the most romantic.

Ponce de Leon, an aged Spanish governor of Porto Rico, who was seeking the Fountain of Perpetual Youth, discovered—not the long-sought fountain, but a peninsula decked with such a profusion of flowers that he named the country Florida.

From that time until years after it was ceded to the United States Florida was repeatedly baptized in blood. From the first there were encounters between the Spanish and Indians in which no quarter was given on either side. Later, an exterminating warfare broke out between the French and Spanish when a Huguenot colony was massacred and not a man, woman, or child spared. In 1586 St. Augustine was burned by Sir Francis Drake, and a century later it was plundered by English buccaneers. Still later, frequent contests were waged between the English colonies and the Spanish in Florida.

Previous to the acquisition of Florida by the United States hostile Indians, together with fugitive whites and renegade negroes who had joined them, made many raids upon the settlements in Georgia, robbing and burning plantations, murdering the whites, and carrying off the slaves. Retaliation to a certain extent was meted out to the bloodthirsty savages until Spain was glad to cede the peninsula to the United States in 1819 for five million dollars. Thereby she ridded herself of her troublesome protégés. The Indian raids still continued after the acquisition, and the United States Government therefore sent troops into Florida to punish the treacherous savages, who gradually retreated southward until they reached the Everglades. There they made their final stand.

In these almost inaccessible sinuous water passages and the dense island vegetation for a long time the Indians baffled

our ablest military officers. A seven years' contest followed which cost the United States fifteen hundred men and nearly twenty million dollars.

After much negotiation and no end of trouble the Indians—they were the Seminoles—ceded their lands to the

Group of Seminole Indians in the Everglades of Florida

United States on the promise of an annuity of twenty-five thousand dollars and suitable lands in the Indian Territory. About four thousand of the Seminoles were then removed to their new homes; a small remnant refusing to emigrate were left behind.

The name Everglades is applied to a vast swamp containing a multitude of shallow lakes studded with numer-

ous islands. The region embraces most of the southern part of Florida. The water of the lakes, of which Lake Okechobee is the largest, varies in depth from a few inches to ten feet. The region itself has an area six times that of the State of Rhode Island, and on account of the difficulty in traversing it is but imperfectly known. Countless winding intricate water channels extend in every direction. Many of these are filled with tall sawgrass which, growing from the bottom, greatly impedes the passage even of small boats. The average elevation of the Everglades above sea level is scarcely twenty feet. The water is both clear and wholesome, but the surface is so nearly a dead level that the current is imperceptible; it can be distinguished only by noting the position of the grass.

The islands are covered with a dense growth of oak, pine, cypress, and palmetto trees, together with a jungle of luxuriant tropical vines and shrubs. They range in size from one to one hundred acres and are but slightly elevated above the surrounding waters.

About three hundred Seminole Indians inhabit the interior and live by hunting and fishing. Deer, bears, otters, panthers, wild cats, and snakes frequent the land; alligators, crocodiles, fish of various kinds, and water-fowl dwell in the water. In the western part of the Everglades is Big Cypress Swamp and in the extreme southern part Mangrove Swamp, where myriads of mosquitoes are hatched out. Extending along the eastern side of the Everglades is a long, narrow belt of dry, fertile land which is utilized for farming purposes.

A far-reaching project to reclaim the Everglades has been proposed. Unlike the Western projects, the problem is to get rid of water and not to supply it. The plans for reclamation include the construction of drainage canals and the clearing of the jungle growths. It is purposed to use

the land thus reclaimed for sugar growing. At the present time the United States is importing annually over two hundred million dollars' worth of sugar; it is estimated that by draining only a part of this vast area and planting it to sugar cane the local demands could not only be supplied but a large surplus for export would result.

The possibilities of this region, when properly drained and cleared of its superfluous vegetation, are almost beyond computation. It has a rich soil, abundant moisture, and almost tropical climate. Reclaimed land of this character is suitable for raising not only sugar cane and subtropical fruits, but a great variety of other crops. It is estimated that the cost of reclaiming the Everglades, so that the land may be made productive, need not exceed one dollar per acre.

A great impetus has been given to southern Florida by that wonderful achievement of engineering, Mr. Henry Flagler's Florida East Coast Railway. This railway stretches in a direct line along the coast from Jacksonville to the southern part of the State, and has been extended along the Florida Keys to Key West. When all arrangements are completed, the trains will be ferried across Florida Strait between Havana and Key West, and freight will be sent from points in Cuba to New York and Chicago without reloading.

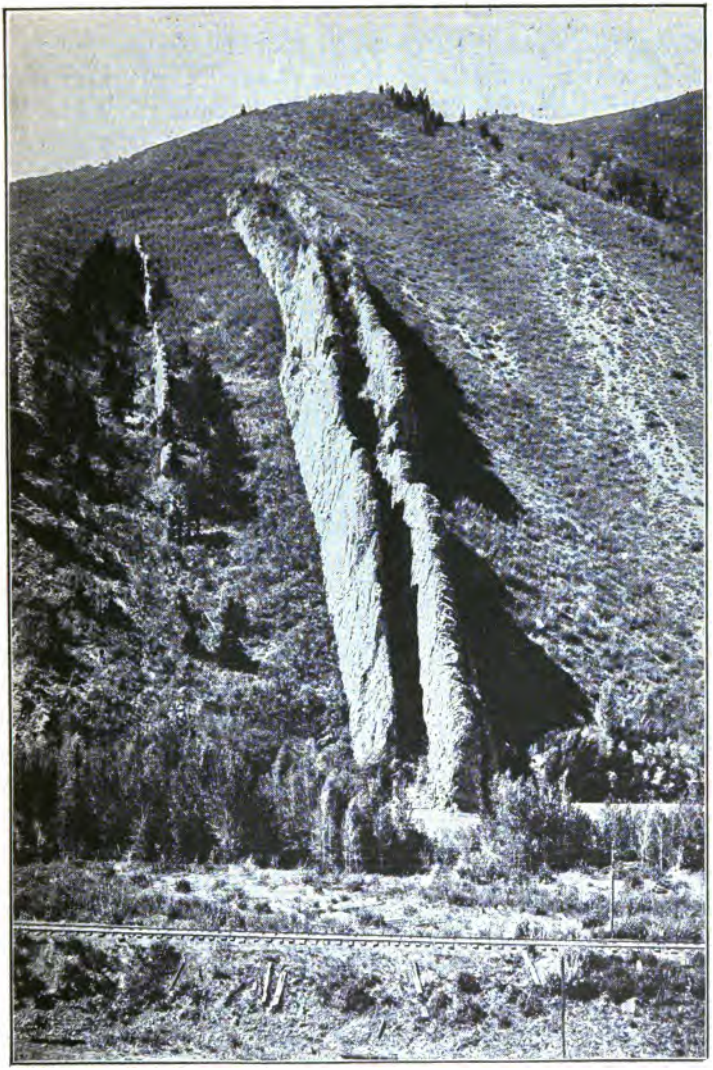
The building of the Florida East Coast Railway is one of the great engineering feats of the world. In its construction from key to key thousands of tons of rock and cement were dumped into the water on which massive viaducts in fifty-foot spans have been built to carry the road-bed. These solid archways, rising from twenty to thirty feet above the water, defy tides and storm waves. This railway has become one of the chief factors in developing the resources of southern Florida and hastening the reclamation of the Everglades.

CHAPTER XVII

STRANGE ROCK FORMATIONS—NATURAL BRIDGES

ALMOST any unusual form in nature is apt to attract the eye and interest the beholder; and when such natural objects resemble artificial ones or bear a fanciful resemblance to animals the similarity intensifies the interest and almost always leads one to apply fanciful names to them. In wandering along a rocky shore one instinctively searches for the curious formations carved out by the unceasing action of the waves; and in journeying through rugged sections of mountain country each unusual rock formation rivets the attention at once.

Caves especially have a peculiar attraction of awe and curiosity combined. Such natural objects as Mammoth Cave in Kentucky, Luray Cave in Virginia, Calaveras Cave in California, the Garden of the Gods in Colorado, the Giant's Causeway on the north coast of Ireland, and Fingal's Cave on the island of Staffa are visited annually by many thousands of people. And no wonder that all mankind, from the savage to the most civilized, is charmed with natural arches spanning great chasms. No cyclopædia of natural wonders fails to give at least a brief description of the Natural Bridge of Virginia which spans a small stream that flows into the James River. So great a wonder was the structure regarded to be even in colonial times that it then claimed marked attention. Thomas Jefferson became so much interested in this natural wonder that he applied to George III for a reservation of land that should include the bridge, and in 1774 his request was granted. To accommodate dis-



The Devil's Slide, Weber Canyon, Utah

tinguished strangers who might visit the bridge, Jefferson built near by a log cabin of two rooms. Concerning it he said: "The bridge will draw the attention of the world."

Chief-Justice Marshall described it as "God's greatest miracle in stone." And Henry Clay said it was "the bridge not made with hands, that spans a river, carries a highway, and makes two mountains one." On the rocky abutments are found carved the names of many persons. Among them is that of Washington. In his youth, laboriously cutting places for his hands and feet, he climbed up the face of one of the steep abutments and cut his name above all others, where for seventy years it stood unsurpassed in height. In 1818 a daring college student climbed from the foot to the top of the rock, thus outranking all others.

The Natural Bridge is composed of blue limestone; it is two hundred and fifteen feet high, ninety feet wide, and spans a chasm eighty-five feet across. A public highway lined with trees passes over the top. The bridge itself is all that remains of the roof of what once was a limestone cavern.

The southeastern part of Utah is overlaid with strata of red and yellow sandstone hundreds of feet deep. Ages ago this whole region was elevated and thereby was distorted by the internal forces which pushed it upward. Subsequently wonderful transformations were wrought. The flowing streams gradually bored through portions of the soft, uplifted sandstone, forming arches and digging deep canyons, while the air and rain rounded off the rugged parts into graceful shapes.

Wonderful as is the famous Natural Bridge of Virginia, the natural bridges of Utah are still more wonderful. In White Canyon of southeastern Utah are Edwin, Carolyn, and Augusta Bridges—magnificent structures of pink sand-

stone carved in lines of classic symmetry and possessing gigantic proportions. At least half a dozen natural bridges in Utah surpass that of Virginia, not only in beauty and grandeur, but also in dimensions. They were discovered by cattlemen in 1895, but they did not become known to

Witch Rocks, near Echo Canyon, Utah

the outside world until 1909, when the region was explored by the Utah Archæological Expedition.

Of these bridges the Edwin easily ranks first in graceful symmetry; its span is one hundred and ninety-four feet, its elevation one hundred and eight feet, its width thirty-five feet. Combining grace and massiveness, the Augusta stands pre-eminent. It rises in majestic proportions to the height of two hundred and twenty-two feet and has a span between abutments of two hundred and sixteen feet. The width of

the road-bed is twenty-eight feet and the thickness of the arch at the keystone is forty-five feet. The height of the Carolyn Bridge is two hundred and five feet and the span one hundred and eighty-six feet.

All these bridges span canyons whose depths correspond to the height of the arched structures. In White Canyon, a few miles below Edwin Bridge, under its overhanging rock walls, are the ruins of numerous cliff-dwellings.

The largest natural bridge in the world yet discovered is the Nonnezoshi. It is in Nonnezoshiboko Canyon, Utah, not far from the place where the San Juan River enters the Colorado. This mammoth arch is more of a flying buttress spanning the canyon than a real bridge. Its height is three hundred and eight feet and its span two hundred and eighty-five feet.

To visit these bridges from the nearest railway station requires stage and horseback riding for upward of one hundred and twenty-five miles. The latter part of the journey is made over a faint trail through a rugged country; but the scenery amply repays one for the hardships endured.

The climatic changes during the ages have been such that this region is now almost inaccessible on account of the lack of water, except in the early spring when melting snows yield a temporary supply. Even the cattlemen pasturing their herds in that section keep them there but a few weeks during the year, so scarce is both water and vegetation.

In the main, natural bridges are the result of one or another of several causes. A limestone cavern may be partly destroyed by streams of water, leaving a portion of the cavern with its roof still in place; the part of the roof thus remaining becomes the arch of the bridge. A branch of the Southern Railway threads a natural tunnel near Anniston, Ala., and the tunnel is the remnant of an old limestone cavern.

In other cases a natural bridge is formed when bowlders,

or a mass of rock, tumbling into a deep crevice is wedged and held in place. In still other instances a layer of hard or slowly weathering rock may rest upon a layer of rock which weathers rapidly. In such cases, if the rock layers form the face of a cliff, natural bridges, caverns, and overhangs are apt to result.

CHAPTER XVIII

STRANGE ROCK FORMATIONS—TABLE MOUNTAIN OF CALIFORNIA

THERE are many table mountains in different parts of the world, but the one which I am about to describe is interesting both from geological and financial stand-points. The so-called Table Mountain of California is a massive natural railway embankment or colossal Chinese wall, extending through several counties, but best studied in Tuolumne County.

The mountain is forty miles long, from five hundred to eight hundred feet high, and a quarter of a mile wide at the top. For the most part the top is bare of vegetation and quite level, though slanting slightly toward the south. In places at the base of its precipitous sides, and sometimes extending part way up, pine and other trees are found growing.

This gigantic wall, broken through in several places by flowing rivers, is nothing more nor less than a mighty stream of congealed basaltic lava called latite, which in prehistoric times, rushing down the western flank of the high Sierras, usurped the bed of an ancient river channel, drinking up the waters and piling up its molten mass bank high.

The bed of the stream being filled with lava, its waters not flowing through the gravel, were forced to find other

channels. The action of the elements during subsequent ages has worn away in great part the banks of the pliocene river and eroded in places the solid slate rocks to the depth of two thousand feet, leaving this sinuous wall as a mute witness of the mighty forces of nature.

On account of the excessive hardness and durability of this kind of basalt, this monumental fortress will endure long after the corroding tooth of time shall have crumbled to dust the royal pyramids and their very memory shall have been lost in oblivion.

Some geologists think there were two volcanic streams of lava, one succeeding the other by an interval of thousands of years, the first covering the auriferous gravel and the second quenching the waters of a subsequent river which had forced a passageway through the first flow of lava.

Scores of tunnels have been run into the mountain to get at the gravel of this Pactolian river. Millions of dollars of gold have been extracted from its bed, and millions more await the tunnel, upraise, and drift of the adventurous miner.

Beginning at the top of the mountain and working downward, we find the order of materials as follows: A cap of basalt from sixty to three hundred feet thick, a bed of breccia of varying thickness, two hundred feet of conglomerate andesitic sand (volcanic ash of the miners), a bed of pipe-clay, and then auriferous gravel resting on a bedrock of slate. In tapping the ancient river-bed considerable water is encountered flowing through the gravel. To get rid of this water has been a problem of expense and annoyance to the miner.

To measure the time that has passed since this buried river rolled over golden sands staggers the intellect. It is estimated that from one hundred and fifty thousand to four hundred thousand years must have elapsed.

This curiously formed mountain has been likened to a monolithian serpent. Where the Stanislaus River breaks abruptly through the mountain the eye gazes in wonder from the crest down two thousand feet to a seemingly tiny crowded stream below, rushing madly on its way to the sea.

Many interesting remains of animals have been found in the gravels under this mountain. In running a tunnel under Table Mountain some years ago, the miners came across a large mass of tallow weighing about one hundred and fifty pounds, and in proximity were the bones and tusks of a huge animal. Many bones and tusks of the mammoth and mastodon, not to mention the remains of other animals, have been found in the ancient river-bed. Probably some of these elephantine animals were sporting in the water and dashing it over themselves when the stream of lava, sweeping down, overwhelmed them, trying out the tallow and preserving their skeletons for the wonderment of civilized man.

At one place in the mountain the deep roar of a waterfall is heard. At another, where there is a deep break, is a series of passageways and caves where the outlaw Murietta had his hiding-place. In several places on the top of the mountain, by striking the foot down hard, a hollow, reverberating sound is heard. We give in his own words the account of an explorer's visit to the so-called Boston tunnel which runs beneath Table Mountain:

"Hearing of a celebrated petrified tree in the Boston tunnel, which runs under Table Mountain, I determined if possible to see it and procure some specimens. After considerable inquiry I found a miner who said he knew where the tree was; that the tunnel in which it was located had been abandoned many years ago; that no persons had entered it for years; that rocks were constantly falling, making it exceedingly dangerous to enter, and that very likely it was so clogged up with rocks that no one could get to the

tree. When I had expressed my great desire to see this tree, and coaxed him, at length he promised to take me to the tunnel to see its condition, but said he would not promise to guide me into it.

"Having dressed ourselves in overalls and jumpers, with candles and geological hammers in hand we set out for our destination. On approaching the tunnel my guide at once began to throw stones into the bushes on either side of the entrance. When asked why he threw the stones, he replied that about the mouth of old tunnels rattlesnakes are wont to resort to get out of the burning sun.

"Not finding any rattlers, we proceeded down the incline to the mouth of the tunnel. Finding the mouth not obstructed, and lighting our candles, we entered. Sometimes crawling on our hands and knees over fallen rock with scarcely a foot of extra room above our heads, then stooping low, then walking upright, again crawling between huge masses of rock and earth, and crowding between slanting monoliths, we made our way through the mud and water dripping on us from the roof above.

"When part way in, the guide hesitated and declared that we were taking our lives in our hands if we went farther; that the five-ton rock lying in front of our path had very recently fallen from the roof, probably a week before, possibly a day or only an hour before. Pointing to the roof with his candle he said: 'Do you see that piece of rock partly detached and ready to fall at any moment?'

"Acknowledging the threatening conditions, I urged: 'If not too dangerous, I do wish that we might go on until we find the tree.'

"Said he: 'If you promise not to strike any of these rocks with your hammer, we will venture a little farther.'

"You may be assured that I not only promised, but obeyed.

"At this juncture, I must confess, a peculiar sensation came over me when I thought of the possibility of being buried alive or crushed to death in this subterranean cavern, yet pride kept me from showing the white feather.

"The guide, going ahead and examining the walls and roof, called back to me in a low voice, saying, 'We are now safer.'

"Having traversed the main tunnel for a distance of upward of eight hundred feet, and carefully avoiding its branches, we finally came to the object of our search. This tree, four feet in diameter, of opalized wood, stands upright on the left side of the tunnel. The lava had burned off the bark and partly carbonized the outside part, and then the whole had subsequently taken the form of opal silica. There is a space of about four inches between the tree and the surrounding lava.

"By raising the candles above our heads we could look up the body of the tree some thirty feet. When we had broken off some choice specimens from the body of the tree with the hammer we left this subterranean world. On emerging from the tunnel the guide said: 'Thank God, we again see the sunlight.'

"To which I replied: 'Amen.'"

CHAPTER XIX

STRANGE ROCK FORMATIONS—GIBRALTAR

A HUGE projecting limestone rock, in form like a reclining lion, guards the entrance to the narrow water passage which separates Europe from Africa. This wonderful feature, the Rock of Gibraltar, extends directly southward from the mainland of Spain with which it is connected by a low,

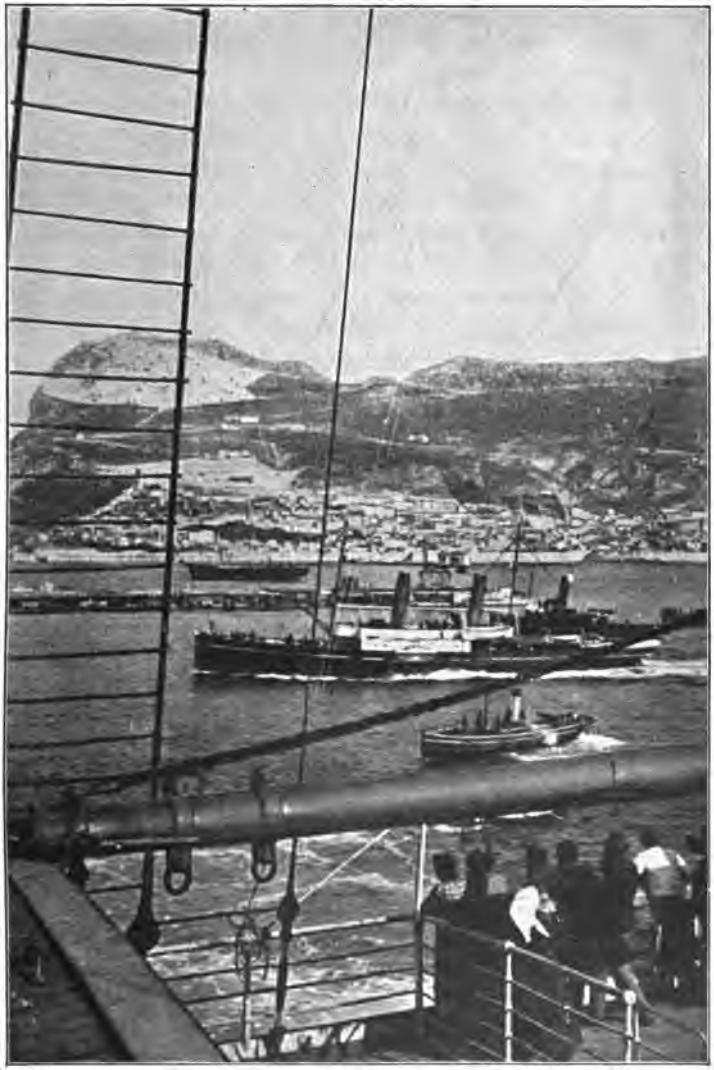
sandy isthmus. It is about three miles in length and in breadth varies from one-fourth to three-fourths of a mile. Two depressions divide it into three summits, the highest of which is about fourteen hundred feet.

Let us visit the small city lying at its western base and then carefully examine this leviathan sentinel that seems to stand guard over the narrow strait. The special permission of the military commander to examine it or even to remain in the city must first be obtained; we are especially warned that cameras are forbidden and all negatives will be confiscated.

The north face we find to have an almost perpendicular height of twelve hundred feet; its east and west sides also display tremendous precipices. The south face is much lower and slopes toward the sea. Fortifications of massive walls and the best of modern guns protect the lower parts and also the seaward side of the city.

But what are those holes high up on the faces of the rock? They are portholes cut through the rock from interior chambers out of which cannon can be thrust and discharged at an invading enemy. We are curious to learn more about this interesting place, and on questioning our guide are told many remarkable stories.

The Rock of Gibraltar is honeycombed with caves, passageways, and chambers, some of which are natural and others artificial. We enter the largest of these natural caves, St. Michael's, and as we stand in the main hall, a spacious chamber two hundred feet in length and seventy feet in height, we are amazed at its beauty and grandeur. Colossal columns of stalactites seem to support its ornamental roof and all around are fantastic figures—foliage of many forms, beautiful statuettes, pillars, pendants, and shapes of picturesque beauty rivalling those of Mammoth Cave. St. Michael's Cave is eleven hundred feet above sea level



This strong and impregnable place is the Rock of Gibraltar, and the city nestling at its base, Gibraltar

and is connected by winding passages with four other caves of a similar character.

To six of the caves distinct names have been given. One of the caves is three hundred feet below sea level. About three miles of passageways, exclusive of many storage chambers, have been hewn so as to connect the different caves and natural passages, and so large have they been made that a wagon can be drawn through them. Within this rock are stored supplies of ammunition and sufficient provisions to last several years. In clambering about the rock we find cannon carefully concealed in scores of different places ready for use when needed.

In places the rock is overlaid with thin soil which produces a variety of vegetation. There are grassy glens, with trees, and luxuriant gardens surrounding pretty English cottages. During the rainy season wild flowers in great profusion spring up in all directions, but in the summer the rock presents a dry, barren aspect.

This strong and impregnable place is the Rock of Gibraltar and the city nestling at its base, Gibraltar. The city has a population of twenty-five thousand, of whom several thousand are soldiers forming the garrison. The garrison with their artillery, two pieces of which weigh one hundred tons each, reinforced with the strongest of fortifications, are thought to be capable of withstanding the combined hosts of Christendom.

Early in the eighth century the Moors, perceiving the strategic importance of the promontory, took possession of it and erected fortifications. During the succeeding nine hundred years the fortress was besieged no less than twelve times, and on several occasions was captured by invaders.

At length it became a possession of Spain, and so strongly was it fortified by the Spanish that it was thought to be impregnable. During the War of the Spanish Succession,

however, the combined forces of England and Holland laid siege to it, and after a stubborn resistance the garrison was forced to surrender. Forthwith the English took possession in the name of Queen Anne and, strengthening the fortifications, have held the fortress ever since.

Spain was greatly mortified by the loss of this stronghold which she deemed rightly belonged to her. Several times during the ensuing seventy-five years, single-handed, she laid siege to the citadel in the endeavor to win it back, but each time she signally failed.

A seemingly auspicious time arrived in 1779 when she secured the co-operation of France. For the succeeding four years a relentless siege was laid to the fortress by the combined land and naval forces of Spain and France. Both nations summoned to their aid their ablest generals and admirals, using every conceivable device and strategy to capture the fortress, but all in vain.

During the first years of this siege the supreme command of both land and naval forces rested with the Spanish, but, having met with failure after failure, they were ready at length to give way to the French, who promised to capture the stronghold by constructing a powerful fleet of battering-ships, enabling them to fight at close range, so that gun to gun and man to man should decide the contest.

The French engineer who prepared the armament cut down the huge bulwarks of the sides of ten of the Spanish battle-ships and proceeded to reconstruct them within and without. The reconstructed ships were much like the *Merrimac*, that did such destructive work in our Civil War, except that they were not armored with iron. Triple beams of heavy oak with layers of sand and cork between them were used for encasing these huge hulks. For protecting the crews heavy timbers covered with rope and hides were used.

On September 12, 1782, fifty line-of-battle ships flying

flags, together with a fleet of smaller vessels, lined up before the town. This formidable fleet was supported on land by an army of forty thousand men reinforced with batteries of the heaviest ordnance stretched along the shore. To oppose these the English commander, General Eliott, had ninety-six pieces of artillery and seven thousand men. So confident was the enemy of success that the triple-armored battering-ships moved boldly up to within half-gunshot range.

At a signal the English opened fire, which was instantly answered by the floating batteries and the whole shore line; four hundred guns were then playing on the beleaguered town. Soon death and destruction were made evident on both sides. There seemed to be but one thing for the English to do to save themselves, and that was to set fire to the enemy's ships. Accordingly, furnaces were placed beside the batteries in which heavy cannon balls were made white-hot. The guns, shotted with these glowing balls, were then turned on the ships. The enemy attempted to guard against the hot shot by continually pumping water into the layer of sand between the wooden sheathing of the ships, and for a time succeeded in extinguishing the fires.

It was not long though before the admiral's ship caught fire, and as night drew on, the flames, indicating the position of the Spanish line, furnished a mark for the English guns. At midnight ten of the besieging ships were on fire. Rockets were thrown up and distress signals hoisted to summon aid from their consorts.

The flames mounted higher and higher, illuminating sky, sea, and rock. The shrieks of the wounded and dying filled the midnight air. When it was found that the ships could not be saved, all discipline was lost and a panic ensued. Hundreds perished miserably, while hundreds of others threw themselves into the sea. Seeing the terrible

destruction wrought by firing hot balls, General Eliott ordered his men to man the boats in order to save their foes from drowning and burning.

With the greatest heroism they scoured the sea, and, mounting the burning vessels, dragged from the decks men deserted by their own people. While performing these humanitarian acts several of the English perished by explosions. Three hundred and fifty-seven of the enemy were saved from a horrible death. The following morning disclosed a sea covered with wrecks. A few days more of feeble bombardment ensued; then a treaty of peace was signed.

From a strategic stand-point, the Rock of Gibraltar is easily Great Britain's most important stronghold, because it guards the trade route to her most important possession—British India. Practically all her commerce with her Indian colonies passes through the Mediterranean Sea and the Suez Canal. With either one in the possession of an enemy, British commerce would not only suffer heavy losses, but it might be destroyed altogether. So necessary is the command of the Strait of Gibraltar to Great Britain, that to lose the Rock might also mean the loss of British India.

At the present time Great Britain is continually adding to the defences by building new fortifications and replacing the older guns with the latest patterns.

In ancient times the name Calpe was applied to the rock of Gibraltar and Abyla to the eminence in Africa on the opposite side of the strait, and both of these eminences formed the renowned Pillars of Hercules. For centuries no ships navigating the Mediterranean dared sail beyond these pillars.

CHAPTER XX

THE BAKU OIL FIELDS

Crossing the Black Sea, we leave the steamer at Batum and take the train for Baku, the commercial centre of the greatest oil field in the world—a region where the supply of petroleum and natural gas seems almost inexhaustible. Immense subterranean oil reservoirs underlie this entire region and extend eastward under the Caspian Sea and beyond to the Balkan hills.

Not only do oil and gas exude from the ground, but, as in the California fields, they come up through the sea-bottom; the oil floats on the surface of the water and the gas, pure as that used in our cities, passes off into the air. In several places gas which bubbles up through the sea-water may be ignited; then for a long distance the sea seems to be aflame. In many places on the land a fire for lighting or heating purposes is made by thrusting a pipe down into the ground and igniting the gas which rises in the tube.

The waters of the Caspian Sea along the Baku shore are usually fine for bathing, but if the wind blows inland for a while the oil floating on its surface accumulates, forming a black scum on the top, putting an end to the bathers' sport until an offshore wind sets in.

Ten miles from Baku, once upon a time, there was a temple over a cleft in the rocks from which gas arises. The gas was kept burning, tended by Parsee priests, for more than two thousand years and until the advent of the modern oil well. This flame was a special object of adoration by the fire-worshippers who were the followers of Zoroaster, and many went there to pay homage to it.

In this region one may travel for miles and miles without seeing a tree, shrub, or blade of grass. The landscape consists of a rolling surface of rocks and sand. It is barren, dry, and destitute of all objects of interest. Sometimes for six months or more not a drop of rain falls to lay the dust. If we go into the section where oil-wells are sunk, a slight relief to the view is afforded by the mounds of sand marking the sites of oil wells, derricks, the inky petroleum lakes, and the huge iron reservoirs. But all around is dry and dusty save where the oil has mingled with the earth; there the surroundings are not only unpleasant to sight and smell but ruinous to peace of mind as well.

For twenty-five centuries this region has been famous for its petroleum, and for upward of a thousand years the surrounding peoples have had recourse to these springs to obtain supplies of oil for medicinal and domestic purposes. Herodotus has given an interesting description of them. Even in the early part of the twelfth century petroleum was an important article of export from Baku. Crude petroleum was used to anoint camels for mange. In the first part of the eighteenth century Peter the Great annexed Baku to Russia. After his death it was ceded back to Persia; but in 1801 it was again annexed to Russia.

To-day Baku is one of the important commercial cities of the Russian Empire. Its shipping is immense and to further its commerce there are magnificent docks. The city is built on the shores of a large bay, sheltered from adverse winds by an island that acts as a breakwater. The water-front has an anchorage for thousands of vessels. One may walk along the strand for eight miles and find ships lined up in front of the city the entire distance.

The Caspian is filled with various kinds of fish, and while bathing one might reasonably have the impression that he was swimming in an aquarium. In fact, this place is an ideal

one for an Izaak Walton. On the islands beyond the peninsula, projecting out from the Baku section, petroleum gas has flamed for centuries, lighting the heavens at night with a lurid glare that is visible far out at sea.

In Baku Bay, between two peninsulas, there was a spot, now commercialized into a producing oil well, where the gas came to the surface with sufficient force to upset small boats. Many of the oil wells are spouters for a long time after they are first bored, and when they cease to spout they can frequently be made to renew their activity by deeper boring.

Wells have been pumped for years without the level of the oil being lowered in the slightest. Some of the wells which have caught fire accidentally have burned for years, sending up their pillars of fire to a great height. In a few instances the richest wells have made the owners practically bankrupt by overwhelming the buildings on adjoining property with sand and petroleum, spreading ruin far and wide before the flow could be checked.

A majority of the great oil wells are about ten miles from Baku, and a dozen pipe-lines convey the petroleum from them to Black Town, a suburb of Baku, where it is stored and refined. From one well alone the escaping oil would have brought more than five million dollars had it been saved.

Seemingly the crust of the earth for hundreds of miles around acts like a huge gasometer pressing down on the pent-up gases with its weight. Since the Caspian Sea is eighty feet below sea level, it is probable that the land bordering the sea has sunk since the gases and oil were formed. And this would, in part at least, account for the enormous pressure.

The spouting oil wells are called fountains. Some of them have yielded two million gallons each day for months,

sending up jets three or four hundred feet high with a roar that could be heard several miles away. Great difficulty was found at first in stopping the flow when necessary by capping or gagging the wells, but after a time a sliding valve-cap was invented, capable of checking the flow of the most

Landing-place for commerce on the Caspian Sea

violent well. In order to prevent the enormous pressure from bursting the pipe and tearing up the ground, as soon as the pipe has been sunk part way the earth is excavated around it and the excavation is filled with cement.

It is said that one of these gushers threw up in a day more oil than is produced by all the wells in the United States. One well spouted oil for months before it could be gagged, and in the meantime flooded the surrounding country. Millions of gallons were burned to get rid of it and millions more were diverted into the Caspian Sea. Two wells are

reported to have thrown up in less than a month thirty million gallons each.

At first sand is thrown out with the oil, and frequently it is ejected with such force that a plate of iron three inches thick struck by the stream is worn through in less than a day by this liquid sand blast. When the wells cease spouting and it is not deemed advisable to bore deeper, pumping is employed. Generally the oil coming from the wells is conducted into large, carefully tamped excavations in the ground forming ponds or lakes. In these huge reservoirs the sand and heavier parts soon sink, making the bottom impervious. After the settling the petroleum is either pumped into large iron tanks or sent directly to the refinery by pipe-lines.

Since petroleum is vastly cheaper than coal, the steamers plying on the Caspian Sea and the locomotives of many of the Russian railroads use oil for fuel. At one time so great was the accumulation of petroleum that it sold at the wells for a few cents a ton. A fleet of tank-steamers conveys the oil products to the interior of Russia by the Caspian Sea and Volga River route.

The crude petroleum of Baku yields a lower percentage of kerosene than the American wells, but it contains more lubricating oil. Millions of gallons of lubricating oil are shipped from Baku each year to all parts of Europe. On the opposite side of the Caspian there are great cliffs of mineral wax such as is obtained from petroleum and used extensively in the manufacture of paraffin candles.

More than two hundred different products are made from petroleum, among the chief of which are kerosene, lubricating oil, benzine, gasoline, vaseline, and paraffin.

CHAPTER XXI

THE SOUTH AFRICAN DIAMOND FIELDS

MANY of the great treasure fields of the world have been discovered by chance rather than careful search.

The diamonds of the Deccan, India, were trodden under foot for ages before they were recognized as diamonds. In Brazil the gold placer miners threw away the glassy pebbles as worthless and the black slaves used them as counters in their card games. A visitor who was acquainted with the diamond fields of India happened one day to notice the shining stones which two men were using in a card game at a public-house. The brilliancy of the pebbles piqued his curiosity. Having secured some, he tested them and found them to be diamonds of the first water. Yet so great was the prejudice against the Brazilian diamonds at first that for years many were secretly shipped to India and thence sent to the diamond market as Indian diamonds.

A trivial circumstance often leads to a marvellous change in the conditions of men, communities, and nations. The playful act of a Boer lad picking up a shining pebble on the banks of the Orange River served as a beacon to lure persons to search for the most precious and hardest of gems, the diamond, and thereby transformed South Africa.

It was the beginning of an industry that has already added more than four hundred million dollars' worth of wealth to the world and which now yields annually twenty million dollars' worth of diamonds. The history of the South African diamond mines is a fascinating story from start to finish.

A Boer farmer named Jacobs had made his home on the

banks of the Orange River not far from Hopetown. Here, living in a squalid hovel, he eked out a precarious existence by hunting and grazing. His chief income was from the flocks of sheep and goats that grazed on the scanty herbage of the veld. Black servants were the shepherds, and the children, having no work to employ their time, were free to roam over karoo, and veld, and along the river.

What children are not attracted by pebbly streams? Wading in the water and skating flat stones on its surface was a joyous pastime for them. The banks of the river were strewn with stones of various colors and sizes such as would naturally attract the eyes of children.

There were rich red garnets, variegated jaspers, chalcedonies and agates of many hues mingled with rock-crystals. The children would fill their pockets with these colored pebbles and carry them home to use in play.

One day the farmer's wife noticed an unusually brilliant pebble among the other stones that were being tossed about by the children. Soon after she told one of her neighbors that the children had found a curious glassy stone that sparkled brilliantly in the sunlight. On his expressing a desire to see the stone, it was brought to him covered with dirt. He was attracted by its brilliance and, probably surmising that it was more valuable than common quartz crystal, offered to purchase it. The good-wife scorned the idea of taking money for a smooth stone, and told him laughingly that he was welcome to it.

The stone was sent by post to Grahamtown to ascertain whether or not it was of value. To the astonishment of all concerned it was pronounced a genuine diamond and was sold for twenty-five hundred dollars. A search was forthwith made in the locality for other stones, but none was found. Ten months later a second diamond was found thirty miles away on the bank of the same river. Then

quite a number of fine diamonds were found by prospectors along the Vaal River.

In 1869 a black shepherd boy found a magnificent white diamond which was purchased for five hundred sheep, ten oxen, and a horse. The purchaser sold the gem for fifty-five thousand dollars, and it was subsequently resold for one hundred thousand dollars. This superb gem became famous as the star of South Africa.

Although a few skeptics said these stones might have been brought from the far interior in the crops of ostriches, yet this last great find served to attract public notice, and soon thousands of prospectors came to seek the coveted gems. Even the stolid Boer caught the excitement, and trekked long distances with wife and children to reach the captivating fields.

It was a motley throng, like a mighty stream, which poured into the valley of the Vaal. Men came hurrying in all sorts of ways, afoot, on horseback, and in heavy, creaking ox-wagons. For miles and miles men were quickly at work sinking holes into the ground; camp-fires were flaming; teamsters were inspanning and outspanning their oxen, and wagons were creaking. These, with raucous voices shouting in a babel of languages, made a pandemonium exciting enough for the most adventurous.

As far as the eye could reach along the banks of the Vaal were seen hives of busy, hopeful men who believed that untold riches were almost within their grasp. The hardest of work was but a pastime, for if they did not find diamonds to-day, would they not to-morrow? Did not their neighbors find them? The next shovelful of earth might contain a precious gem. They could hardly afford time to eat or sleep. Flashing eyes and elastic steps marked the success of some, while others repressed their feelings and kept their own counsel regarding the extent of their finds.

So great did the crowd become that it was necessary to limit claims, and at an informal meeting of the prospectors, a digging committee was formed to make regulations controlling the working of the digging. Thirty feet square was thought to be a reasonable claim for one person. Some sought the river's banks to prospect, others the kopjes or hills. Some pinned their faith to light-colored ground, others to dark. Fancy rather than reason dictated the choice.

The manner of working a claim was simple. The earth was thrown into a cradle having a bottom of perforated zinc or of wire mesh. The cradle was then rapidly rocked to and fro as water was poured in upon the earth. The finer part was washed through the mesh and the worthless stones were thrown out by hand. The residue was then removed to a suitable place and carefully examined.

Each person most vigilantly scrutinized his hoard, fearing that in an unguarded moment a fortune might slip through his hands and be lost. Even the stranger passing along was hardly given a glance, so eager was each individual in searching for the precious pebble.

There is an entrancing interest in diamond mining far exceeding that of gold, for at any moment one is likely to come across a princely fortune. The miner is ever hopeful. Communing with himself, he says: "To-morrow I may be made independent by a lucky find." And for a time it was merely luck, for so irregularly distributed were the diamonds that no knowledge was gained as to where they were most likely to be found.

While miners were strenuously working along the rivers, far more wonderful diamond regions were soon to be unfolded, regions rich beyond the loftiest flights of the imagination and equal to the fabled valley of Sindbad the Sailor.

A thrifty Dutch vrau owned a farm on a volcanic plateau extending for miles into the rocky kopjes. Her overseer,

learning that garnets are often found associated with diamonds, and noticing some garnets in one of the small streams that coursed through the valley, concluded to do a little prospecting on his own account. Sinking a hole a few feet in depth and sifting the sand and gravel through a common sieve, he came across a diamond weighing fifty carats—nearly half an ounce.

This find caused a rush to the farm to secure claims, and the widow, with an eye to business, charged a monthly license of ten dollars. Soon this discovery was eclipsed by a more remarkable one at Dutoitspan[1] in 1870. Although a fair supply of diamonds was found near the surface, these diggings seemed to give out as they reached hard limestone.

When nearly all of the prospectors had left the field, having become discouraged, one more sanguine than the others determined to find out what was beneath this limestone covering. Sinking a shaft, he found that the limestone grew so soft and friable that it could be easily dug out with a pick. When he had penetrated the limestone covering he came in contact with a hard layer somewhat of the nature of clay. This he proceeded to break up and sift. During the sifting process he observed many sparkling gems. The problem had been partly solved at least. Diamonds were to be found in greater abundance below than above the limestone covering. On learning of the changed condition of affairs the deserting miners hastened back to the diggings in double-quick time.

Early in 1871 diamonds were found at Bultfontein[2] and on the De Beers farm, two miles from Dutoitspan. Five

[1] The term pan is a name applied to a basin or pool in which water collects during the rainy season.

[2] Fontein is a word of Dutch origin meaning fountain or spring. In this hot and semi-arid country a pan or fontein was a necessity to the Boer farmer, whose chief dependence was on his sheep and cattle. Hence he was wont to settle near where water could be easily obtained.

months later another bed of diamonds was found on the same farm, lying on a sloping kopje, one mile from the first location. This kopje, named Colesberg Kopje, became afterward the famous Kimberley mine. The district was immediately divided into claims and taken by prospectors.

The climate of this section is exceedingly trying. A blazing sun, clouds of suffocating dust, and a scanty supply of muddy water are the conditions of the region; it therefore required remarkable physical endurance and an indomitable will to achieve results. Sometimes terrific thunder-storms with torrents of rain would sweep through the valley. At other times great hail-storms would drive both man and beast to the nearest shelter. Wind-storms frequently drove blinding clouds of dust that penetrated everything.

Very quickly a city of tents sprang up at Kimberley to be superseded later by substantial buildings of wood, of brick and iron, and well-constructed streets. Water was pumped from the Vaal River through a main sixteen miles in length. It was then raised in three lifts by powerful engines to a large reservoir five hundred feet above the river.

The introduction of an abundant supply of good water wrought a wonderful transformation. Outside the business section the desert was made to blossom with flowers in gardens surrounding the hitherto bleak homes. Lawns were laid out and vines and trees planted about the houses, making the dusty, wind-swept expanse a thing of beauty and comfort.

At length prospectors learned that the diamond-bearing earth was confined chiefly to several oval-shaped funnels, ranging in area from ten to twenty acres, and that outside these few diamonds were to be found.

Now these huge funnels, or pipes, are nothing more or less than extinct volcanic craters. The walls, or casings, of these pipes are chiefly of shale and basalt filled with hard

earth, yellow near the surface and bluish deeper down. The latter is called "blue-stuff" and is very prolific in diamonds. The diamonds found outside the rim wall must have been washed out of the craters or perhaps were thrown out by the eruption.

At first it was customary to pulverize the blue-stuff at once, but experience showed that a more satisfactory way to work it was to expose it for several months to the action of the weather. By this process it readily crumbled.

Various devices were used by the different miners to raise the earth out of their claims. Some used windlasses; others carried the earth up in buckets and tubs, some even by climbing ladders. Surrounding the funnels were carts, wheelbarrows, etc., for carrying away the material to the depositing grounds, where it was dried, pulverized, and sifted.

Many of the miners found it desirable to employ the native Kafirs to work in the pits, since neither the scorching sun nor clouds of dust seemed to trouble them.

The deeper the pits were sunk the greater the difficulty became in raising the blue-stuff. To add to the difficulties the rim wall of shale and basalt began to fall in, and the rain made the claims muddy and slippery or filled them with water. At a still greater depth water began to seep through the shale wall, and great masses of the rim occasionally fell in endangering life and almost precluding further mining unless concerted action were taken. So, in order to effect more economical methods of working, a consolidation of claims began to take place.

At the Kimberley mine a double platform with staging was built around the pit, and a series of wires running from the different claims served as trackways on which buckets of the blue-stuff were drawn up by means of ropes and windlasses located on these platforms.

When still greater depth had been reached and much of

the rim wall had been precipitated into the pit and rain and seepage water had made the pits mud holes, two remarkable persons who were interested in the mines took a leading part in solving the difficulties. These persons were Cecil John Rhodes and Barnett Isaacs, better known as "Barney Barnato." Rhodes owned stock in the De Beers and Barnato in the Kimberley mine. At first they were sharp rivals in gaining control, but later they got together and consolidated interests.

Cecil Rhodes was an English college student. He had lost his health and had come to South Africa at the invitation of his brother, who was interested in the diamond mines. Roughly dressed, his clothes covered with dust, this shy, pale student, week in and week out, might be seen looking after the Kafirs who worked his brother's claim.

Barney Barnato, a young Hebrew of keen foresight, likewise had a brother in South Africa. The latter, who was engaged in diamond buying, urged Barney to come at once to this famous region, setting forth the wonderful opportunities offered for business. Barnato forthwith packed his few belongings and took the next steamer for Cape Town. He was only twenty years old and was bubbling over with good-natured energy; but he was quick to perceive and quick to act.

Although he had but a few dollars with which to start in business, yet by indomitable energy and shrewd management he soon acquired sufficient money to buy a few small claims in the famous Kimberley mine. To these claims he constantly added others until he became one of the leading stockholders in the mine.

When the rival mines began to undersell each other and diamonds were being sold for but little more than the cost of production, Rhodes conceived the plan of consolidating all the mines, thereby forming a monopoly to keep up the

prices. By masterly skill he brought this about, purchasing some shares outright, and giving shares in the new company as payment for others. To make the purchases he negotiated a loan of several million dollars through the Rothschilds, the famous bankers of London.

Open workings of the diamond mine, Kimberley

Thus, after many years of struggle through difficulties that were seemingly superhuman, the four great mines, the De Beers, Kimberley, Dutoitspan, and Bultfontein, were merged into one great corporation. Afterward some others were added, but all bear the name De Beers Consolidated Mines, Limited, a corporation which to-day controls the diamond market of the world. During the eleven years ending 1899 they yielded nearly six tons of diamonds.

Both Rhodes and Barnato acquired immense wealth by

their investments, but it is doubtful if either gained much happiness from his acquisitions. Poor Barnato! He had gained riches and stood among the foremost financiers of the world, but at how fearful a cost! His overtaxed brain began to give way, and on his way back to England he suddenly leaped overboard and was drowned.

Cecil Rhodes was instrumental in enlarging British influence and territory in South Africa, and to him England owes a deep debt of gratitude. He died in 1902 leaving a portion of his immense fortune for scholarships in Oxford, England's great university. Rhodes earnestly advocated the building of a railroad from Cape Town to Cairo. Already this line has been constructed northward from Cape Town several hundred miles beyond Victoria Falls, directly below which it crosses the Zambezi River.

Diamonds of various colors are found in the African mines—brown, yellow, pale blue, clear, and black. The black diamonds, called bort, are used mainly for arming diamond drills and for polishing other diamonds. Green, pink, and mauve diamonds are found occasionally.

The De Beers mines have produced some notable stones. From the Premier mine a diamond weighing more than three thousand carats—one and thirty-seven hundredths pounds avoirdupois—was obtained. This stone, more than twice the size of any heretofore found and estimated to be worth five million dollars, was insured for two million five hundred thousand dollars. It was named the Cullinan, from one Tom Cullinan, who purchased the farm on which the Premier mine is located.

Captain Wells, the manager of the Premier, one evening, after a burning hot day, when work had been suspended, strolled over to the mine, and, while partly walking and partly sliding down into the pit, noticed a gleam from a stone half-embedded in the earth. In a moment he had

the stone in his hand and his practised eye told him this was the greatest diamond the world ever saw.

At first the possession of it seemed more like a dream than a reality, and he began to doubt his own sanity. When held up to the blazing Southern Cross, it sparkled like the purest crystal, and he knew that its value must be reckoned in hundreds of thousands of dollars.

He immediately took the priceless treasure to the company's office where it was critically examined. It was then sent for safe-keeping to the Standard Bank at Johannesburg, and afterward was forwarded to London. For some time it was deposited in a London bank, the name of which was kept secret for fear that its great value might tempt criminals. Two years after its discovery it was purchased by the Transvaal Government, at the suggestion of General Botha, and presented to King Edward VII as a crown jewel.

The De Beers Company employs upward of eleven thousand African natives—Kafirs, they are called—working above and below ground. They come not only from the surrounding districts but from regions hundreds of miles away. All native laborers are kept in large walled enclosures, or compounds, which are covered with wire netting to prevent the laborers from throwing diamonds over the walls to confederates outside. Twelve such enclosures are owned by the De Beers Company, the largest of which occupies four acres and contains ample space for housing three thousand natives.

On entering the service of the company each applicant must sign a contract to live in the compound and work faithfully at least three months. At the expiration of his contract he may leave or make another contract, as he wills.

Constant vigilance is maintained in order to prevent stealing diamonds, and yet, notwithstanding this watchfulness,

it is estimated that hundreds of thousands of dollars' worth of diamonds are stolen each year.

Everything necessary for the sustenance and comfort of the men is brought into the compounds, and no one is permitted to leave until the expiration of his contract except by permission of the overseer, which is seldom given. The men go out of the compounds to their work through tunnels and return the same way.

Besides the native Kafirs already mentioned, about two thousand white laborers are employed, the greater number being engaged in the offices and workshops and on the depositing floors.

Electric lights are used throughout the mines, and underground work is carried on both day and night by three shifts. Every known scientific device is pressed into service. In all of the deep mines the laborers are taken up and down the shafts in cages.

The method of mining and working the diamond-bearing earth at present employed is far more economical than in former years. After the blue material has been brought up it is carried to the depositing floors where it is allowed to remain several months. In the meanwhile it is harrowed several times to break the lumps. The part that resists this treatment is carried to a mill to be crushed. The disintegrated and pulverized material is then carried to the washing machines.

The coarser fragments of the concentrates from the washing machines are picked out by hand; the finer are sent to the pulsators. Each shaking-table of the pulsators is made of corrugated iron plates in several sections with a drop of about an inch from one division to another.

A sufficient quantity of thick grease is spread over the plates to cover them to the top of the corrugations. The concentrates are continuously spread over the upper por-

tion of the table automatically while running water washes them down.

Strange as it may seem, the diamonds stick fast to the grease; the other material is washed away. It has been found by trial that grease will cling to the precious stones

Sorting gravel for diamonds in the Kimberley mine

but to nothing else. After a few hours the grease with the diamonds is scraped off the tables and steamed in perforated vessels to separate them.

One of the De Beers mines has been worked to a depth of about two thousand feet with no diminution in the quantity or quality of the diamonds. The "pipe" or plug of blue-stuff shows no signs of giving out. Nature, in her underground laboratory, works in a mysterious way, baffling the astutest students of science to find the process by which she is able to manufacture such beautiful gems as the diamond.

Many theories have been propounded to explain the genesis of the diamond, the most plausible one being that the crystallization of the carbon is due to a very high temperature and tremendous pressure acting on the carbon in a liquid form deep down beneath the earth's surface. The crystals, intermingled with much foreign matter, are afterward projected upward, filling these great volcanic pipes.

In order to produce the most beautiful effect, diamonds are usually cut into one or another of three different forms, namely, rose, table, and brilliant, the shape and size of the stone determining which form is best. The double-cut brilliant is the most common form at the present day. The general form of rough, crystallized diamonds is that of two square pyramids joined at their bases. The crystals are oftenest found octahedral and dodecahedral—that is, eight and twelve sided, and the diamond-cutter takes advantage of these forms in shaping the diamond.

The modern lapidary must have a perfect knowledge of optics and be a skilful stone-cutter. The numerous planes or faces which he cuts on the surface of the diamond are called facets. In the treatment three distinct processes are utilized—cleaving, cutting, and polishing. The lapidary must study the individual character of each stone and determine whether to cleave or grind off the superfluous matter so as to correct flaws and imperfections. All this calls for the judgment which comes only with long experience, for if the cutter errs he may ruin a priceless gem.

The grinding and polishing are done by diamond dust mixed with oil spread on the upper surface of a grooved flat steel wheel revolving horizontally. The diamond, having been set in fusible solder, is firmly pressed against the surface of the wheel by a small projecting arm and clamp. When one facet has been finished, the diamond is removed from the solder and reset for grinding another facet. Thus

the workman continues until the grinding and polishing are completed. Infinite patience and steadiness of nerve, as well as steadiness of hand, are required for such delicate and exact work. Sometimes two uncut stones are cemented into the ends of two sticks. Then the operator, using these sticks as handles, presses the stones against each other with a rubbing motion, the surface of the stones being coated over with diamond dust and oil to accelerate the process.

The last cutting of the celebrated Kohinoor diamond cost forty thousand dollars. One may understand, therefore, that the expense of cutting a large diamond adds materially to its cost. The diamond-cutting industry is confined chiefly to Amsterdam, where the work employs several thousand persons, mostly Hebrews, the craft having been handed down from father to son through several generations. Much fine cutting is now done in New York also.

PART II

OCEANIA

CHAPTER XXII

THE ISLANDS OF THE PACIFIC

Not until four hundred years ago did the body of water now named the Pacific Ocean become known to the people of Europe.

A vague knowledge of a sea that washed the eastern shores of Cathay, or China, was gained from the reports of the famous Venetian traveller, Marco Polo. After spending several years in the Orient, Polo returned home in 1295, giving such marvellous accounts of the countries visited and things seen that his stories were but half believed.

In 1531, Balboa, a Spanish explorer stationed at Darien, now Colon, hearing rumors that a great ocean lay to the opposite side, determined to test the truth of the report. Taking with him about three hundred men, he laboriously worked his way through the jungles of the isthmus; and on reaching the top of the divide beheld for the first time the Pacific Ocean. He then hastened forward, and as he reached the shore he waded into the water and took possession of it in the name of his sovereign. He named it the South Sea.

But the vast extent of this sheet of water did not become well known until fifty years later, when brave Ferdinand Magellan circumnavigated the globe. Two and one-half centuries more elapsed before the memorable voyages and discoveries of Captain Cook disclosed the fact that the new

ocean world was studded with countless islands, and that most of them were densely inhabited by savages.

Just how or when all these islands became inhabited is not definitely known. Since the Polynesian languages in general are similar, it is conjectured that the inhabitants of the islands have a common origin and that many of the more northerly groups were peopled by emigrants from the south.

In a general way the name Oceania is applied to all of the islands in the Pacific, but in a more limited sense only to those lying between the American continent and Australasia.

The chief divisions of Oceania are Australasia, Melanesia, Micronesia, and Polynesia. Australia, the largest body of land, is usually regarded as a continent. Nearly all the smaller islands are of coral or of volcanic origin; in many instances both agencies have contributed to their formation. The coral and volcanic islands seem to be the tops of mountain ranges that, little by little, have sunk, until only their higher summits are now above sea level.

The central part of the Pacific Ocean is pre-eminently the home of the reef-building coral. Countless islands and reefs, wholly or partly built up by these tiny creatures, are found widely scattered over an immense area limited to one thousand eight hundred miles on each side of the equator. All these formations are composed of the compact limestone remains of coral polyps.

These polyps have the power of extracting carbonate of lime from the sea-water and building it into massive formations which, for the most part, are nearly or completely submerged.

The reef-building coral differs very materially in form and appearance from the precious or red coral; the former is confined to comparatively shallow water, while the latter

is found most commonly at a depth of six hundred feet or more, and it occurs chiefly in the Mediterranean Sea. The common or reef-building coral has but little use except as a source of lime, and no intrinsic value except as an object of curiosity.

Coral reefs may be arranged under three classes; namely, fringing reefs, barrier reefs, and atolls. The first class embraces the shallow-water reefs found close to land, either surrounding islands or skirting the shores of continents. The reefs of the second class likewise skirt islands or continents, but at such distances as to leave a deep channel between them and the shore. The third class are called atolls; each is irregularly ring-shaped and almost entirely encloses a sheet of water, called a lagoon.

The ring-shaped reef, or atoll, is broken in one or more places, generally on the leeward side, and built up higher on the windward side. The reason for such omissions and buildings is obvious when we remember that the coral animal cannot move from its fixed position to seek food, but must depend upon the waves to bring it within reach. The water dashing up against the reef on the windward side brings an abundance of food, while the slight movement of the waves on the leeward side brings but little food.

After many years the dead coral is broken off and piled up on the reef. In this condition it is cemented by the lime in the sea-water, thereby forming a nucleus for land. Then, perchance, a cocoanut drifts upon the formation and, finding sufficient nutriment, sends down a root and begins its growth. Other cocoanuts are drifted to the newly disintegrated coral soil until the tropical vegetation becomes capable of sustaining animal life. Or, perhaps, a portion of the ocean bed in that particular region is uplifted by the volcanic forces, thus greatly enlarging the land area. Attracted by the new land, people from near-by islands emi-

grate and take possession of the unoccupied area. Thus the upbuilding of islands and their occupancy goes on through the centuries.

From the fact that these formations exist at a depth of several thousand feet, while coral polyps themselves can

A Malay girl

live only near the surface, it is thought that either the sea bottom must have been sinking for a long period of time or else that the cinder cones around which the reefs are built must have shrunk away until their tops are below sea level. At all events they seem to be due to volcanic movement.

Differences in environment produce marked differences on people in various parts of the continental world. Like-

wise, differences in the geological structure of the islands of the Pacific have produced a marked influence on the inhabitants of the islands of the Pacific. Those living on large and mountainous islands, where the productions are varied and abundant, are greatly superior mentally and physically to those inhabiting the small low-lying coral islands.

In the small islands, where there are few objects of interest and the circle of life is necessarily circumscribed and food and building material scanty, the inhabitants are dwarfed in intellect and their languages limited in vocabulary. The inhabitants of the extensive Paumoto group of islands give a striking example of the dreary monotony of life on small coral islands. Indeed, coral atolls are lacking in pretty nearly all the features that are necessary for a high degree of civilization; nature, therefore, reacts, with the result that the human life of this region is in a condition of savagery. Many of the natives are cannibals.

The natives of Australia are a race that seems to be separate and distinct in itself. Wherever they are found their speech and customs are so nearly alike that little or no doubt of their common origin exists. They are so small in stature that by some scholars they are classed with pygmy peoples. They are repulsive in appearance in their native state, but when the children are trained by English families they become attractive. They are regarded as a very low type of intellect; yet at the missionary schools the children seem to learn about as quickly as do European children. The children learn to figure readily, but the older natives have no names for numbers greater than three or four.

In New Guinea and the adjacent islands is found a race of black peoples usually called Negritos, or Negroids. They are black and, like the African negroes, have black, kinky hair. They are far superior to the native Australians.

Many of the tribes are good farmers, and cultivate crops of sago, maize, and tobacco. On the coasts there are good boat-builders and sailors. The greater part of the Melanesian tribes is hostile and blood-thirsty; head-hunting is a common practice. In many tribes the people live in communal houses like those of the Pueblo Indians of America.

A Malay boy

A large part of the population of Oceania is of Malay origin. As a rule the Malaysians are intelligent and take readily to western civilization. They are confined chiefly to the larger islands south and west of the Asian continent. In such parts of Malaysia as have become European possessions, they are farm laborers, and in this employment they have no superiors.

Of all the native peoples of Oceania, the Polynesians are perhaps the most interesting. In physical appearance they are tall, well-formed, dark of complexion, and black-haired. In the northern island groups—Tonga, Hawaii, Samoa, Tahiti, and others—which are colonized by European and American peoples, the natives have gradually acquired western civilization. The number of natives has decreased,

however, and only about one-third of the population of fifty years ago remains to-day.

The animal and vegetable life is peculiar. That of Australia resembles the life forms of a geological age long since past; that of the islands near tropical Asia is Asian in character. Now there are many large islands at a considerable distance from the continent in which many of the life forms on the slopes facing Australia are Australian, while on the northerly and westerly slopes they are Asian. One cannot be certain, however, that these islands were ever a part of the Australian continent, or that they were ever joined to Asia. On the contrary it is more probable that the life in question was carried by winds and currents of the sea.

The life forms of the coral atolls are very few in number. So far as vegetation is concerned, the cocoa-palm and bread-fruit are about the only kinds of plant life of importance. A few species of fish and migratory birds are the only animals that may be used as food.

The names given to the various divisions of Oceania are more or less fanciful. Australasia means Southern Asia; Malaysia, Malayan Asia; Melanesia, the islands of the blacks; Micronesia, small islands; and Polynesia, many islands.

During the latter half of the nineteenth century practically all of Oceania has been divided among European powers. Australia, Tasmania, and New Zealand are peopled by colonists from England; but they possess the character of a great nation rather than that of colonies. A few of the larger islands have become producers of sugar, cotton, and fruit. The long distance from the markets for their products is offset by the low cost of native labor. The coral islands are almost valueless for commercial products; but a few of them are used as coaling stations, telegraphic cable stations, or as positions of naval advantage.

CHAPTER XXIII

AUSTRALIA

EARLY in the sixteenth century the island of Australia became known to the Portuguese; later the Dutch, who had valuable possessions in the East Indies, sent exploring expeditions to spy out the new land, and named it New Holland. But not until after Captain Cook, of the English navy, had explored the eastern part did any one think the country to be more than a barren waste sparsely inhabited by savages. Indeed, various European nations who were even then seeking lands for colonization thought it too worthless to claim.

In April, 1770, Captain Cook made his first landing on the east coast and, finding at one place a profusion of beautiful flowers, named the indentation Botany Bay. He spent a considerable time in exploring the eastern coast and also the Great Barrier Reef. In going through one of the passages across the Barrier Reef his vessel ran aground, and in order to lighten it he was obliged to throw overboard six of his heaviest cannon. In late years efforts have been made to secure these cannon as souvenirs, but the search for them has proved unavailing. One may easily imagine that they have been long since entombed in thick growths of coral.

On his return home, Cook gave such a glowing account of the great island that the English Government forthwith sent out a body of soldiers to take possession of the country and to make settlements. Because it is well watered, the southeastern part was selected as best adapted for colonization. For a long time this part of Australia was utilized chiefly as a penal colony, but the fruitful land and salubri-

ous climate quickly attracted free emigrants from England. Then gold was discovered, and thousands of people rushed to the new Eldorado, not only from Great Britain but from all parts of the world. Almost in a twinkling it changed from "our remotest colony" to a great country producing annually millions of wealth.

So far as its surface features are concerned, one may regard Australia as a continent not quite so large as the United States. The eastern part is diversified by low ranges of mountains fantastically scored and carved by rivers which are swift and impassable torrents during the season of rains, and trickling streams, or dry washes, the rest of the year. This is the region that has produced a wealth of gold and wool and a stock of hardy people that for intelligence and strength of character can scarcely be matched elsewhere.

The central part of the continent is a dish-shaped tableland. Its surface is sandy here, stony there, but intensely hot and desolate everywhere—desolate of everything that adds to the comfort of man, but full of about everything that contributes to his misery. The "bush" which covers so much of this region is chiefly acacia, and the acacia is chiefly thorns. The rivers that flow into the interior from the coast highlands seem at first sight to be formidable streams so far as appearance goes. One, the Murray, is more than a thousand miles in length. But even the Murray will match the description which an English traveller gave to Platte River —"A mile wide, an inch deep, and bottom on top!"

The few lakes of the interior are great "sinks," or marshes, much like Humboldt Sink, in Nevada. They are shallow, reed-grown, and briny, and they are bordered by mud flats and quicksands between which there is little to choose. An unfortunate victim will sink in the one quite as quickly as in the other. But even the lakes are gradually going the way of all lakes. In this case, however, their disappearance

is due largely to the dust storms that little by little are burying them.

Only a very small part of the central region can be reclaimed; for where there is so little rain there can be but

A giant fig-tree, 140 feet in circumference

little either of surface or of ground waters. During the intensely hot summer season the smaller streams disappear entirely and the larger ones become a succession of stagnant pools along the dry washes.

The eastern part of the continent, on account of its greater

extent of coast, is far richer in resources than the central section. It contains not only a greater proportion of land fit for grazing and cultivation, but also very rich mines. Perhaps these have not a greater wealth of minerals than the mines of the central section, but they are so situated that they can be more easily worked.

The great island of Tasmania ought also to be included in the Australian continent; for it is separated from it by a narrow and not very deep strait. In its general features Tasmania resembles eastern Australia; and, indeed, it is one of the most productive and delightful parts of the world.

Of the whole Australian continent scarcely one part in fourteen is fit for human habitation, not because the soil is lacking in elements of fertility but because there is not enough rainfall. As a matter of fact, the rain-bearing winds bring rain only to the eastern and southeastern part of the continent. Any map will show that nearly all the cities, towns, herding-grounds, and settlements are in that part of the continent, and they are there because the rainfall is there.

The rest of Australia is like the Sahara in one respect; it is a desert. Beyond that fact the resemblance between the two ceases; indeed, they could scarcely be more unlike; for, while the Sahara is much like any other desert, Australia is unlike any other part of the world.

Not very much is known about the interior because but few explorers have been able to penetrate the continent. Many have tried to explore its fastnesses, it is true, and many bones are bleaching in its furnace-like desert. Even a century after the eastern part had become dotted with settlements the interior was so little known that the government of South Australia offered a reward of ten thousand pounds to any one who would start from Adelaide and cross the island due north. Now, ten thousand pounds, or fifty

thousand dollars, is a large sum of money, and there were many efforts to obtain it.

In 1860 an explorer named Stuart, whose name is remembered in a high peak which he discovered, traversed more than half the distance. It was a record trip, but illness forced Stuart to turn back. Another expedition, headed by four plucky men, Burke, Wills, Grery, and King, were more lucky on their outward trip. They reached tide-water near the head of the Gulf of Carpenteria, thereby accomplishing the task. The return trip was tragic. When they had reached the relief depot at which they had planned to have supplies awaiting them, they found nothing. They wandered about until all but King died from exposure and starvation. A year or two later Stuart made a third attempt and found what is now an "overland route," for a telegraph line has been built along it from Adelaide to the north coast, and this connects with an ocean cable to London.

A mother kangaroo with a young kangaroo in her pocket

The plant and animal life of Australia forms one of its

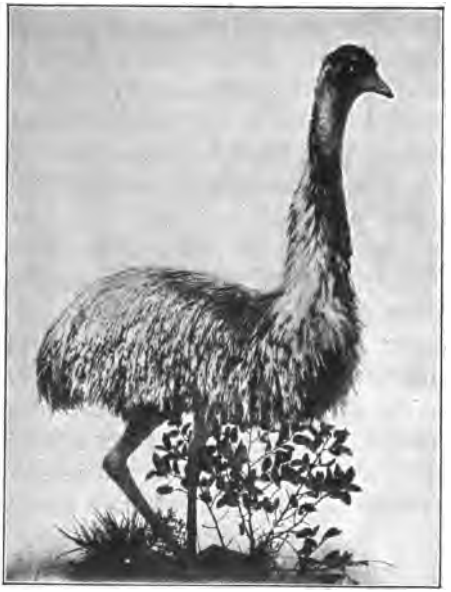
most remarkable features. Both plants and animals are of the kind that lived many ages ago. One of the curiosities of forest life is the "gum," or eucalyptus, a belt of which almost surrounds the continent. In its native home the blue gum is a most beautiful tree that sometimes grows to a height of three hundred feet. When the tree begins its growth the stem is nearly square in shape and the leaves are almost circular. After a short time, however, the branches and trunk become circular and the leaves long and lance-shaped. They hang with their edges instead of their flat surfaces to the light, which also is true of many other Australian trees. The eucalyptus sheds—not its leaves every year, but its bark instead.

Many plants which in other continents are small shrubs in Australia are trees. The tulip, the fern, the honeysuckle, and the lily are examples. They all grow in tree form and are of considerable size. There is no turf grass except that which is cultivated. The wild grasses are of the "bunch" or clump species, and some of these have blades so sharp that they cut cruelly. One species, the porcupine grass, bears a name that does not belie its character. Much of the coast lands are covered with a growth of thorny "scrub" that has made cultivation both difficult and costly. The interior is the "bush" region.

The animal life of the continent is even more singular than the plant life. Most of the animals resemble the opossum of North American fauna in one respect, the mother carries her young in a pouch or fold of the skin under her body. But the opossum itself is not confined to North America alone; there are several species in Australia and Tasmania. The kangaroos are among the most remarkable animals, not only because of the great length and strength of their hind legs, but also because of the variety in the sizes of the different species. Some of the smaller

species are no larger than a small rat; the large-sized species are six feet tall when sitting on their haunches.

There are no monkeys and no animals that chew the cud, but there is a wonderful variety of birds. Among them is the emeu, a kind of ostrich that practically is wingless. Another, the platypus, or duck-bill, has the bill and webbed feet of a duck and the body and tail of a beaver. Stranger still, the female duck-bill lays eggs, but nurses her young after the eggs are hatched! The duck-bill carries a hinged spur on the hind legs, which also is a sting that injects a violent poison into whatever it strikes. Ordinarily the spur is folded against the leg of the animal, but when used as a weapon it stands out like the gaff of a fighting cock. The duck-bill may well boast of its sting, because the honey-bee of Australia has none.



An Australian emeu

The dingo, or wild dog, may not be an especially interesting animal to the student of natural history, but it is a very interesting one to the herdsman. For of all animals in Australia the dingo is the most intolerable nuisance on account of its fondness for mutton. Hunting the coyote on

the plains of the United States is a pastime, but hunting the Australian dingo is a serious and monotonous business. Indeed, the sheep and the dingo cannot both remain in Australia unless the former has been eaten by the latter. In a single night a dingo will kill a score of sheep, and a pack of them will make way with several hundred. In one instance two of these pests killed and maimed more than four hundred sheep before retribution overtook them.

In addition to the troubles of native origin, three very serious pests have been imported. One of these, the species of cactus known as the prickly pear, the Queenslander has pretty nearly all to himself. Just how the prickly pear was introduced into Australia seems to be a matter of uncertainty. But it is there and it is spreading rapidly. Each plant produces scores of pears and each pear contains not far from one hundred seeds. When the fruit ripens the seeds are quickly sent broadcast. Perhaps the wind is the chief agent in scattering them, but wild birds, especially the emeu and the turkey, are a good second. Queenslanders fear that this pernicious plant will spread not only over the great interior desert sections, but to the valuable land elsewhere, since it is tenacious of life and thrives on arid land amidst a burning heat where other plants wither up and perish.

In clearing the land of the cactus three methods are utilized, viz., burning, pitting, and poisoning. Where wood is near at hand, the first method is the preferable one. A platform is made by rolling logs together, and after the plants have been uprooted and hacked to pieces they are hauled in drays to the platforms. There they are stacked up high, sometimes a hundred tons being piled on a single platform, and the platforms are set afire. Pitting is done by digging large, deep pits, filling them full of the chopped plants, and covering them with dirt. Destruction by poisoning is accomplished by inoculating the thick leaves with arsenic

or bluestone, which is sprayed upon them after the plants have been hacked so that the poison may be absorbed by the sap, which distributes the deadly substance.

Years ago some of the colonists thought that it would be desirable to have English rabbits in Australia and sent to England for a few pairs. When the rabbits arrived a great feast was held, and amidst speeches and mutual congratulations the timid creatures were let loose. In a short time rabbits seemed quite plentiful and the hunters had rare sport; but ere long the animals began to eat up the vegetables in the gardens.

Now, rabbits are very prolific, and within a very few years they had spread so extensively that the sheepmen began to complain of their serious inroads on herbage and grass where the sheep fed. At this stage of affairs legislation was invoked in behalf of the suffering farmers. Laws were passed and means taken to reduce the number of rabbits. Poisoned grain and other food was used, but still the rabbits greatly increased. The dingo was tamed and used for hunting them, and then the mongoose was imported from India to kill them off.

But the rabbits seemed to have increased a thousand-fold. In despair, rabbit commissioners were appointed in each colony to enforce the building of high rabbit-proof wire fences, and now thousands of miles of wire fences have been built so as to enclose ranges and farms. By means of the fences and by the use of various methods of destroying the pests, they are now kept in check after causing millions of dollars of damage, and at an enormous annual expense to the colonists. In the meantime it was discovered that the flesh of the rabbit was excellent food, and the slaughter of millions to be preserved has been a noticeable check to their increase.

Unlike the American Indians, the aboriginal peoples of

Australia were never troublesome to the European settlers, and although apt to be thievish they were not inclined to warlike acts when the European settlements were new. The "bushrangers," as they are called, somewhat resemble the negro peoples, and are thought to be a part of the black race that is found in the island near New Guinea. They are classed as Negroids, or Negritos, and they bear a considerable resemblance to the African pygmies, with whom at least one authority classes them. They are materially larger and taller than the pygmies, however, though below the average stature of Europeans. At all events they are among the lowest type of human beings.

The bushrangers have no fixed habitation; they do not build houses nor live in villages; they have no domestic animals except the dingo, and they do not cultivate the soil. They live nominally by hunting and fishing, but their food consists of about anything that requires no weapons beyond the fish-net and the boomerang. They rarely molest larger game, though some of the tribes employ a net in which to entrap the kangaroo.

Of all the weapons used by savage tribes the boomerang is the most interesting. In shape it is a flat strip of hardwood having an angle, or else slightly curved in the middle. The interesting feature about it is the fact that when skilfully thrown it will return to the thrower unless intercepted. A bushranger may be skilful enough to throw the boomerang ahead of him so that in its return it will kill a small animal back of him.

The bushrangers were only too ready to adopt the vices of Europeans, but they have not been able to withstand the changes wrought by civilization. Their numbers have steadily diminished. In 1880 they were thought to be about eighty thousand in number, but at the close of the century there were scarcely one-fourth as many. Those who re-

Homestead and station in Young district, Australia

main are for the greater part herdsmen and farm laborers.

One may not be very far from right in saying that the climate of the habitable part of the continent is the foremost asset of Australia. Certain it is that for healthfulness and the stimulation that creates activity, the climate of Australia is unsurpassed elsewhere in the world. And because of its life-growing and invigorating character it has placed the Australian high in the rank of the world's foremost people.

Climate and soil, too, have made Australia one of the foremost wool-producing countries of the world. Not far from one hundred million dollars' worth of wool and mutton are exported yearly, and much of the wool clip is a fine grade of merino. Gold is another product of Australia. At the close of the century the mines had produced a total of more than one billion dollars' worth of the metal. In round figures, the great Thirst Land, with a population of about four millions, scattered along the edge of a great desert continent, produces enough wealth to sell yearly about three hundred millions of dollars' worth of its products!

The foregoing picture of Australia presents, perhaps, the unpleasant side of Australian life. But this great Thirst Land, so far from being an inhospitable desert, is one of the world's greatest storehouses of wealth.

CHAPTER XXIV

THE GREAT BARRIER REEF

WITHIN the tropical parts of the great South Sea are submarine gardens that in the beauty of their floral forms and their richness of coloring rival the most elaborate flowerbeds made by man; in color and variety they are fairy

regions of exquisite living animal flowers. One of the greatest and most attractive of these sea gardens lies off the coast of Australia.

Of all the wonderful animal structures in the world the Great Barrier Reef of Australia is the most remarkable. It consists of a chain of coral islands and reefs parallel to the east coast of Queensland. This great reef is about twelve hundred miles long, and the distance from the mainland to its outer border is from ten to more than one hundred miles. It is far enough off the coast to leave a wide channel between the reef and the shore.

Since it is well charted this channel is the route taken by many vessels. It is admirably furnished with lighthouses and light-ships, and is protected from the huge rolling billows of the ocean by the reef itself. There are several breaks in the reef through which vessels can pass out into the open ocean.

This mighty barrier, the work of coral polyps, is of special interest not only on account of the curious shapes and varied kinds of sea life it presents, but because of the commercial value of its products. The bêche-de-mer, pearl, oyster, and sponge fisheries yield an annual revenue of upward of half a million dollars, and when all of the resources of the reef are properly exploited the returns will be more than doubled.

The habitat of the reef-building coral is in clear tropical waters. The polyps thrive best near the surface; they cannot live at a depth exceeding one hundred and twenty-five feet. The reef-building coral must not be confounded with the precious, or red, coral, which flourishes in a muddy sea-bottom and is found chiefly in the Mediterranean Sea.

When alive and in the water, coral polyps present a variety of beautiful forms and colors. Living polyps are composed of limestone skeletons covering and permeating a soft gelatinous substance which corresponds to the flesh of ani-

mals. When the polyps are removed from the water this soon decomposes and disappears; in certain species a part of it flows off as a thick liquid.

Fish fantastically striped and of brilliantly variegated colors are seen swimming among the coral. In tropical waters many of them have fascinating colors and patterns. By simulating the colors of the coral polyps they escape the species that prey upon them.

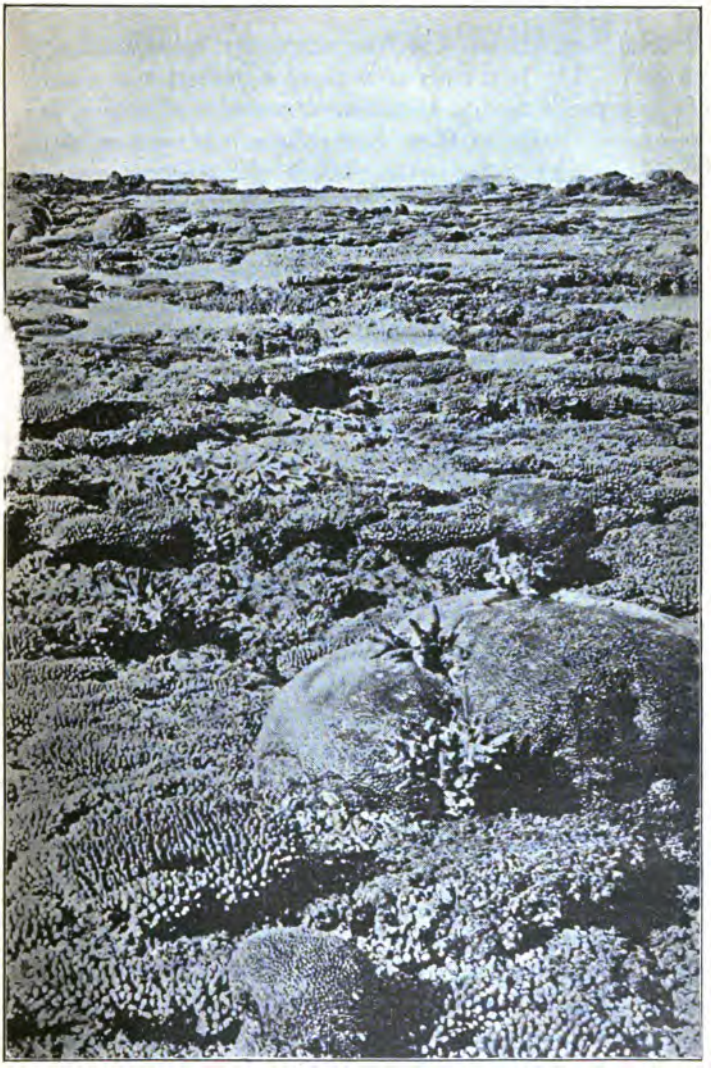
The different kinds of coral are generally designated by common names according to the different objects which they resemble. Thus, by similarity of form we have *brain* coral, *organ-pipe* coral, *mushroom* coral, *staghorn* coral, etc.

Some of the islands and reefs are the homes of sea fowl and at the nesting season are literally covered with their eggs. These fishers of the sea have marvellously well-developed faculties for location, since each bird goes directly to her nest when returning to the islands. As night approaches, when all the birds seek the land, their wild cries are deafening.

Some of the islands are turned to profitable account by the export of guano. On Raine Island, so extensive are the deposits of guano that a railroad has been built to facilitate handling the product.

Bêche-de-mer, or trepang, is a name applied to the flesh of certain sea slugs or sea worms found in the Indian seas. Of this substance great quantities are gathered annually. In the water the animals resemble huge cucumbers, and they are therefore sometimes called "sea-cucumbers." They are found clinging to the rocks below low-water mark, and are from one to four feet in length. Their food consists of microscopic shell-fish which live upon the coral rocks.

The trepang exported from this section requires considerable care in preparation. After being gathered from the rocks they are cleaned, boiled, and partly dried in the



The Great Barrier Reef of Australia, the most remarkable animal structure in the world

air; then they are smoked with mangrove wood until dry and hard. The best class of trepang is packed in tin cases to keep it perfectly dry, as moisture ruins it. The product is marketed chiefly at Hongkong, where it is used in making the gelatinous soups for which the Chinese are so famous.

The pearl-shell fisheries yield products of considerable value. The average depth from which the mother-of-pearl shell is gathered is seven or eight fathoms. Twenty fathoms represents the greatest depth in which divers, even in their diving suits, can work, so great is the pressure of the water upon them.

The fishery is carried on chiefly for securing the shells, the finding of pearls being of secondary importance, since only about one shell in a thousand contains a pearl of much value. The shells themselves bring in the market from three hundred to eight hundred dollars per ton according to quality and size, and are used chiefly for making buttons and small ornaments.

The Cairn Cross Islands, a little coral group midway between Cape Grenville and Cape York, are especially interesting as the home and nesting-place of the Torres Strait pigeons. These large white pigeons are highly esteemed for the table. They gather at the islands during the month of October and remain until the end of March. The nests are usually built in the forked branches of the mangrove trees that form extensive thickets along the coast. Each nest contains two white eggs.

The Australian jungle-fowl or scrub-hen also frequents these islands as well as the mainland. The nests of these birds are large and unique. They consist of huge mounds of dead leaves, grass, sticks, and soft earth piled together by the adult birds in shaded and sequestered places. The mounds are about twenty feet in diameter and from ten to

fifteen feet high. Several pairs of birds ge
their construction.

When the mounds are completed the bir
in the centre and deposit their eggs, whic
hatched by the moist heat engendered by th
tation. Forty or fifty brick-red colored e
those of a turkey are sometimes found in a si
the eggs and the parent birds are excellent

The Australian bee-eater, a bird of attrac
found all over the northern islets of the B
has a long, sharp curved bill and two long,
in its tail. Its beautiful green plumage, v
brown and black, and vivid blue on the thr
attractive bird.

The sea-anemones of the Great Barrier R
able for both beauty of color and structure
measure four or five inches across the expa
Torres Strait are seen brilliant sea-anemo
border of whose disks are jewel-like cluster
tiful sea animals present the appearance of
flowers adorned with the most exquisite gem

Starfish and sea-urchins of all descriptio
immense numbers. The five-rayed varietie
universally condemned as insatiable foes of
ily, and the oyster cultivators destroy all the
dismember the body of the starfish by pullin
like rays does not kill the animal, for not onl
produce new rays but each ray will produce
The predatory starfish fastens itself to bot
oyster, forces them open, and consumes
It is destructive not only to oysters but to
barnacles, snails, worms, and small crustac

The variety of sea life about the great
Among the bivalves the most remarkable f

weight of the shells are the tridachna and hippopus. In some localities they are so numerous that their shells have been burned to make lime. A pair of tridachna valves often weighs several hundred pounds.

To the naturalist the Great Barrier Reef is an object of special attraction.

CHAPTER XXV

THE GOLD FIELDS OF AUSTRALIA

THE name Australia, like that of California, conjures up in the mind visions of gold; and the story of the gold excitement in both is very similar. January 24, 1848, was the red-letter day in California's history, and the news that transpired that day electrified the world. While constructing a saw-mill at Coloma Creek, a branch of the American River, John Marshall picked up a handful of gold nuggets in the mill-race. At once the gold fever seized all far and near. During the ensuing year fifty thousand persons came by sea and by land from the States east of the Rocky Mountains, and forty thousand more from other parts of the world, all bent upon digging for gold in the new El Dorado.

From far-off Australia came vessels crowded with passengers. Among these was Edward H. Hargraves, who had lived for twenty years in New South Wales, where fortune had not smiled on him. Hargraves was a keen observer and something of a geologist as well. He diligently scoured the gullies and canyons in the gold regions of California, and when he quit he possessed a good sum of money as a return for his labor. During his stay in California he became convinced that gold existed in Australia, since many of the formations and strata were similar to those of the gold-bearing fields of California.

After working for nearly two years, he planned to return to his old home, implicitly believing that he could win riches and fame by discoveries of the precious metal in New South Wales; and as soon as he had landed at Sydney he made ready to test his theories. When he explained to his friends what he purposed to do and his reasons they considered him half crazy. Moreover, rumors that convict shepherds had sold gold nuggets to traders in Sydney strengthened his belief that gold in paying quantities could be obtained by seeking for it. There were rumors also that a gold nugget had been picked up on Fish River.

Procuring a team he set forth on his journey for the Blue Mountains lying back of Sydney. On the fourth day out, stopping at an inn kept by a widow, he confided to her his mission and enlisted her co-operation. He requested a black boy for a guide; but instead she sent her son, who was well acquainted with every inch of the region for miles around.

Taking horses, Hargraves and the young man started out from the inn. It was a crisp autumn morning succeeding a dry summer. A careful search was made up and down canyons and gulches. At length, during the latter part of the day, they reached the bank of a dry creek which disclosed strata similar to the auriferous gravels of California.

Looking about, Hargraves found a spot in the bed of the creek from which, after scooping off the top, he scraped from the bed-rock a panful of earth. Hastening to the water hole with the loaded pan, he proceeded to wash away the soil and lo, in the bottom of the pan were bright-yellow particles!

"I shall be made a baronet and both of us will be rich," exclaimed the excited Hargraves. He seemed to be walking upon air and could scarcely believe his own senses. Nevertheless, he prudently kept his own counsel until he had taken out sixty thousand dollars. Then he hastened

to Sydney to lay the matter before the government. The government gave him a reward of fifty thousand dollars for his discoveries and made him commissioner of the gold fields.

Hargraves's unexpected find stimulated other persons to search elsewhere for the attractive metal, and soon other and far richer fields were found. From one locality alone seven tons of gold were obtained in a single month.

The whole country now went gold mad. Doctors left their patients, lawyers their offices, bakers and butchers their shops, clerks the stores, and sailors deserted their ships as soon as they touched the wharves—everybody hastened to the diggings eager to get rich.

When confirmation of the wonderful gold deposits in Australia reached the outside world, a grand rush, like that to California, took place. New towns and cities sprang up as by magic, and from the increase of business the older places rapidly became more populous. Since the time of Hargraves's discovery, Victoria has produced the most gold, some of the largest nuggets in the world having been found in this colony.

The following story of the gold fields is related in Lang's "Australia": While the ship *Dudbrook* was docked at Sydney, where she was receiving her cargo, a sailor boy named Bob heard of the great quantities of gold that had been dug out of the mountains. He longed to try his luck at mining, but hardly knew how he could get away from the ship without being caught.

In the meantime, while the ship was receiving her cargo, all the old crew except Bob had deserted. He hesitated about leaving and seemed to find no good opportunity to escape unnoticed. The day of departure arrived. The sails were being shaken out by the new crew, which had been pressed into service. The little tug that was to tow the big

ship out of the harbor was beginning to straighten the cable and churn the water into foam, but the hawser still held the vessel fast to the wharf. The captain shouted "Bob, Bob, get ashore and cast off the hawser."

Bob now saw the long-waited-for opportunity and with alacrity sprang to the wharf, but not to release the hawser. He ran along, hidden by the jetty, until he reached the shore and then dodged into a house where he had friends. The skipper could not stop to hunt up the runaway, so the vessel was towed out through the Heads and sailed for Newcastle to pick up a cargo for India.

The next day Bob started on foot for the mines and, while on his way, picked up one of his old shipmates with whom he formed a partnership. On arriving at the diggings, the two staked out a claim and began sinking a shaft; but after reaching the bottom no metal greeted their longing eyes. Another shaft was sunk and this time they struck it rich.

Within two months each had saved up one hundred twenty pounds of gold. Like some of his companions, Bob now concluded to take a short rest and go to Sydney for a few days of pleasure. Therefore he changed his gold into pound notes, and, stuffing the big rolls into his trousers' pockets, started for the city.

Being of an economical turn of mind, he concluded to walk, and taking an early start, by the middle of the afternoon he had measured off twenty-five miles. The day was hot and the roads dusty; and seeing a shady nook, near a creek not far from the roadside, he betook himself thither and sat down to wait for a bullock wagon which he had passed two hours before. The water in the stream looked cool and inviting, so he undressed to take a swim.

In taking off his clothes he pulled out of his pockets the two bundles of pound notes and laid them beside his boots. After being in the water for some time, he came out; and

looking where he had laid the notes, could see them nowhere. Who could have taken them? He saw no one around when he undressed, and he had seen no one about while he was bathing. Possibly the thief was hiding behind some of the trees near by. Without waiting to dress, he searched here and there behind trees and logs, but there was no sign of the thief.

He was greatly disheartened at his loss, but, putting on his clothes, he came across a ten-pound note which he had concealed in a side pocket. This find cheered him up and he resolved to go down to the city notwithstanding his loss. The bullock team soon came along and Bob told the driver what had happened. They both searched the ground over to solve the disappearance of the money, but in vain.

When Bob reached Sydney, like other sailors, he visited several barrooms where he told the story of his strange loss. In one of the places, in a corner, sat an old Scotch crone, smoking her pipe and quietly listening to the conversation. At midnight when Bob was about to leave, the old woman said, "What will ye gie me if I find yer money for ye?"

"What will I give ye, mother?" cried Bob. "Why, I'll give ye a silk dress and a ten-pound note."

"It's a bargain!" she cried; and then she told him what to do.

He was to be ready at four the next morning with a horse and trap which he could obtain from the landlord. If he would take along an axe, a roll of string, and a newspaper, she would find his money for him, she said.

Though much in doubt about the power of such articles to find his money, Bob did as old Maggie had directed, and sharply at four in the morning the two started back to his bathing place. It took but a short time to drive back ten miles to the creek and the hollow log on which Bob sat when he pulled off his boots.

"Now, show me the place where ye put the money down," said Maggie.

After carefully looking around she seemed to be satisfied with the conditions.

"Now, gie me the paper and the twine," she said. Taking a portion of the paper and tying it with a long piece of twine she laid it down just where the notes had been placed. Then Maggie said, "Let us seek a shady place a short distance away and I'll play ye at cribbage." Bob took little stock in these seemingly foolish arrangements; nevertheless he determined to be game to the end.

She led the way to a cool place on the creek bank a hundred yards distant where they sat down. She then drew out of her pocket a dirty pack of cards and a bar of soap punched with holes to be used as a cribbage board.

Two games were leisurely played, both of which Maggie won. "Now," said she, "Come wi' me." She hobbled back to where the paper tied with a string had been left. No paper was in sight, but hanging out of the hollow log where Bob had removed his boots was the end of the string. Maggie chuckled, and pointing to the log, cried, "Now rip it up wi' the axe."

Bob set to work with a will and soon had a big hole chopped out of the hollow log, and behold! there were the bank-notes and the newspaper, forming a cozy nest for some little speckled native cats calling for their breakfast, while farther in were seen two bright balls of fire, the mother cat's eyes. The mother cat had run off with Bob's money to make a nest for her young ones.

Maggie accepted the ten-pound note but refused the silk dress, telling the lad that she had no use for such finery.

Soon after the English settled in Australia they introduced merino sheep, and during the last quarter of a century the breed has been constantly improved.

It is estimated that now there are not less than seventy-five million sheep in Australia. The two great drawbacks to this thriving industry are drought and disease. Some years, owing to the scanty rainfall, millions of sheep have starved for lack of food.

Two seasons prevail, the dry and the rainy, the climatic conditions being similar to those of California.

The eastern section of this continental island is the only part that is adapted both to grazing and to agriculture. New South Wales outranks all the other Australian colonies in sheep raising, and Queensland in cattle raising.

Almost the entire eastern shore section is well adapted to the production of lemons, oranges, and figs, while in the southeastern part all kinds of temperate-zone fruits flourish. The production of wheat also deserves important attention.

The development of cold-storage transportation has given a great impetus to the exportation of frozen mutton and beef to England.

Melbourne, the capital of Victoria, situated on Port Philip Bay, near the mouth of the Yarra River, is the largest city of Australia and contains nearly half a million people. It is built chiefly upon two hills and the intervening valley. The streets are broad and cross each other at right angles. Many of the squares are devoted to public parks and gardens. There are splendid public and private buildings, including an excellent library and an art gallery, both of which are free to all. Although less than sixty years old, this young city will compare favorably in regard to its buildings and general management with the largest cities in both Europe and America.

The oldest city in Australia, Sydney, is the capital of New South Wales and has a population of four hundred thousand. It is situated on Port Jackson and is said to have the finest harbor in the world. This is a completely landlocked sheet

Melbourne is the largest city of Australia and contains nearly half a million people

of deep water which can be entered only through a narrow passage, thus affording protection to the shipping, even during the most violent storms, and so large that it could accommodate all of the fleets that sail the ocean and have room to spare.

Of Australia's thirteen thousand miles of railways all but five hundred miles belong to the colonial government, and are administered in the interests of the people. So low are the freight and passenger rates that often a tax has to be levied to meet the deficits. More than half of the public debt is due to government ownership of the railroads.

Among other prominent places may be mentioned Brisbane, the capital of Queensland; Adelaide, the capital of South Australia; and Perth, the capital of Western Australia.

CHAPTER XXVI

TASMANIA

In 1642 a Dutch navigator named Abel Janszoon Tasman discovered the island which now bears his name. Tasman did not know that he had discovered an island, but thought that he had discovered a part of the mainland of Australia; so he named it Van Diemen's Land, in honor of his patron, Anthony Van Diemen, Governor of the Dutch East Indies.

Tasmania was once one vast plateau, but in time nature worked away on its broad surface; mountains and valleys were chiselled in its face, making it a picturesque and diversified island. It is well watered; streams abound in every part, and many large lakes are found in the interior. The Derwent in the south is the largest river, and vessels may go almost to the head of its estuary.

On account of its beautiful mountain scenery, Tasmania is called the Switzerland of Australia. Deep winding valleys, clothed with groves of ferns, give added charm to its scenery. In recent years it has become a famous summer resort for Australians, many of whom pass a portion of the hot season in its wonderful forest solitudes and secluded fern-tree vales.

No attempt to colonize Tasmania was made until 1803. In that year four hundred convicts were brought there and the vessel containing the prisoners sailed up Derwent River and landed them where the city of Hobart now stands.

When the convicts landed, they found a very dark-skinned race of natives in possession of the land. The natives were low of stature, with ugly broad faces, flat noses, and frizzly hair. Their habits were repulsive, but they were inoffensive. They lived chiefly on shell-fish and what they could obtain from the sea. Occasionally they hunted the kangaroo, and unfortunately a kangaroo hunt led to their undoing.

One morning a newly-arrived commander of the convict colony saw a large number of natives making toward the camp. He did not know their customs and mistook a chase after a kangaroo for an attack on the camp. So he ordered the soldiers to fire on the crowd, and, as a result, fifty or more were killed.

This was bad enough, but worse was to come; for escaped convicts began to rob and murder the natives whenever they could do so. So in time there began a bush warfare that almost exterminated the poor natives. Finally, the remnant, about two hundred, were put on a transport and carried to Flinder Island, where they gradually decreased in number. The last native died in 1874.

In 1853, the English government ceased to send convicts to the island, and within a few years afterward the blackest

plague spot in the world became one of the most beautiful colonies on the face of the earth.

Tasmania is far enough south of the tropics to have a much greater rainfall than most of Australia, but it is not far enough to have a cold climate. The generous rainfall covers the whole surface with green. There are forests of eucalyptus, or "gum tree," tree ferns, beech, and acacia—just about the same kinds that one finds in Australia.

The animals, too, are much the same as in Australia, and some species of them are pouched, like the opossum. Many of them are now rarely to be found near the settlements, but one kind is pretty certain to be found at all times and seasons—the Tasmanian devil. This ugly beast is a terror to any neighborhood. An English hunter described it by saying that it was more bear than wildcat, and more wildcat than bear—and bear-cat it is frequently called. The tiger-wolf is another pest that makes great havoc among herds and flocks. Still another pest, also called "devil," has bands of black and white on its neck and shoulders, a thick heavy tail, and a bulldog mouth. It is a cowardly little night prowler with a fondness for young lambs.

As was the case in Australia, the success of sheep-growing and the finding of rich gold-mines put an end to the convict colony. Even before the mines became profitable the ranchmen were trying to stop the sending of convicts to the island; but when the gold fields were found, it was stopped in short order.

Very shortly gold-mining became the leading industry. Then tin ore was found at Mount Bischoff. Tasmania now produces more tin than all the rest of Australasia. In addition to the tin and precious metals, there are great beds of excellent coal—enough for all the smelteries and manufactories in the island.

Next to the mines the sheep and cattle ranches bring the

chief profits to Tasmania. But another industry is growing and bids fair to become more profitable than either mining or cattle-growing. The fruit of Tasmania is of the very finest quality. Moreover, when the fruit is ripening in an Australasian spring and summer, all England is shivering in midwinter storms. What better business could there be than to ship apples and pears fresh from the Tasmanian orchards? Those same apples can be shipped half-way round the world and sold in England for a lower price than the apples shipped from Buffalo to New York City!

Then there are the peaches, cherries, and strawberries. They find a ready market in Australia, a matter of only a few miles away. So in time Tasmania is bound to be one of the great fruit-growing countries in the world.

Where once the first convict colony made its camp the beautiful city of Hobart stands. It is every bit an English town. The business part of the city consists of fine, substantial buildings; most of the residences are low-built and half hidden in gardens of roses. The school-houses are as good as those in any American city of the same size, and the schools themselves are equal to the best anywhere. Kindergarten, grammar school, high school, and university are within the reach of all who desire.

It is said that an enterprising man can go to Tasmania, make his fortune in fifteen years, and return to England rich, to spend the rest of his days. But why should any one desire to leave such a beautiful island to spend the rest of his life in London smoke and fog?

CHAPTER XXVII

NEW ZEALAND

By digging at London right through the centre of the earth one would emerge about a day's ride, in an automobile car, from the capital of New Zealand—if only the automobile could ride on the water. That is to say, England and New Zealand are almost exactly opposite each other on the earth. That is the short way, however, and the trip would be eight thousand miles. As a matter of fact, the trip by the only available route is not far from sixteen thousand miles; for, go either east or west as one may choose, the route from London to New Zealand is a very roundabout way, and New Zealand is Great Britain's most remote colony.

When Tasman was cruising about the Pacific, or South Sea, he skirted the coast of the islands. That was in 1642. About one hundred and forty years afterward Captain Cook called at the islands and annexed them as an English possession, but the English government refused to take them. Early in the nineteenth century missionaries brought the Bible to the native Maoris, and at the same time lawless traders carried liquor and firearms to those same natives. What was still worse, they kept on supplying them with liquor and firearms until there were but a few thousand natives left.

The Maoris are the most remarkable native peoples of the Pacific. They were not the original people of New Zealand, however, for they drove away the black race—probably like that of New Guinea—which they found there. Like the Hawaiians and Fijians, the Maoris came from Samoa about five centuries ago. Their traditions about

their journey are clear and exact; even the names of the canoes, or barges, in which they made the journey are preserved in Maori history. First they went to Rarotonga, an island of the Cook group; then they went to New Zealand.

Maori pa, or village

Long before white men had settled in New Zealand, the Maoris had made great advances toward civilization. They had become wonderful carvers in wood; they were also expert builders, weavers, and dyers. No better seamen could be found in the Pacific. War was their chief employment,

however, and tribal wars were always going on in some parts or other of the islands. One may compare them in progress to the tribes of New York just before the Iroquois confederacy was formed.

Two large and a small island make up the greater part of New Zealand. North Island is a little smaller than New York State; South Island is a little larger; Stewart Island is half the size of Rhode Island.

Aside from these, the Chatham, Auckland, and part of the Cook group—in fact, pretty nearly every outlying group that can be used for cattle and sheep growing—are included in the New Zealand colony. This industry is the reason for the existence of New Zealand; it is the great meat-producing market of Great Britain.

The two largest islands of New Zealand form a great plateau. Mountain ranges border the edges, and fertile, well-watered lowlands are between the ranges. The ranges and valleys, together with hundreds of lakes, are beautiful to the eye; they could not be better for a great grazing industry. Cook Strait, which separates the two islands, is about sixteen miles wide at its narrowest crossing.

North Island has several active volçanoes, and likewise one of the three famous geyser regions in the world. There used to be the Pink-and-White Terraces also—terraces of brilliant coloring, like those of Yellowstone Park. But a few years ago Volcano Tarawera had a bad fit of eruption, and when the eruption was over, Pink-and-White Terraces were covered many feet deep with lava and ash.

Many of the higher ranges are snow-clad the year round. The New Zealanders do not need to go half-way round the world to spend the summer in Switzerland; they have a fine Switzerland at home. Indeed, the Alps of Europe are not surpassed by those of New Zealand; and as for glaciers, the great Tasman Glacier cannot be surpassed—twenty miles

long, a mile wide, and no one knows how deep. In South Island some of the glaciers reach almost to the sea.

There is some wonderful vegetation in New Zealand and nowhere else will one find a greater variety of ferns. Some of

The Petrifying Geyser, New Zealand

them grow in the form of trees; some are huge vines; and still others are as fine and delicate as the maidenhair fern. Some kinds have fine wiry tendrils that are much used for mattresses and cushions. Another plant looks so much like

a palm that no one ignorant of plants would suspect that it was not a palm-tree; but as a matter of fact it is a lily.

So many of the forest trees are evergreens, and so abundant is the grass that at all times of the year the islands are green from the mountain summits to the sea. Of all the forest trees the kauri pine has been one of the most valuable —has been, because not many trees are left. The wood itself is about as easily worked as white pine or California redwood. What is still better, it is very tough and durable.

But the wood itself is only a part of the wealth of the kauri forests. The bark is full of gum which, when hard, is much like amber. It makes a very hard and glossy varnish that commands a high price because of its good qualities. In places where old kauri forests have existed, digging kauri gum is a profitable employment. Kauri-gum mining does not require much capital. A sharp iron rod and a pick are about the only tools required.

The gatherer goes about thrusting his rod into the earth at intervals of a few inches. When he "feels" a piece of gum with his rod he needs only to use his pick to capture it. For many years about a million dollars' worth of kauri gum was thus obtained each year. The lumps vary in size from that of a hen's egg to masses weighing several pounds.

There are also some strange animals in New Zealand. One curious creature is a bird without wings—the kiwi. The species is one of many similar kinds that lived in Australia and New Zealand ages ago. Their remains are found in abundance, but the kiwi is the last species now living. It has a long, sharp bill and hair-like feathers. A full-grown bird is about the size of a bantam fowl. One of the more beautiful birds is a dull green parrot, the kea. But the kea is also a wretched pest, for it has learned how to kill sheep since the sheep-herders came to New Zealand. The kea darts out of the air, fastens its talons in the side of the

sheep, and quickly makes a gaping hole into the animal's vitals. Thousands of sheep are thus killed every year.

There are about one million people in New Zealand, and most of them live on the east side of South Island. That is where the grassy lands are; and that is why the cattle and sheep are there also. And the people are there because of the sheep and cattle. New Zealand is one of the greatest grazing regions in the world, and most of the various industries in the islands have something or other to do with the grazing.

In Australia the sheep are grown almost wholly for wool. That is because climate and grasses are just right for the growth of wool. In New Zealand the climate and grasses are not very good for wool, but they are just right for meat, both mutton and beef. So the commerce of beef and mutton is the chief business of New Zealand.

The meat must go a long way before it reaches the people who consume it; they live in Great Britain and western Europe. In any case, too, it must have a long summer trip; for one cannot go from New Zealand to Europe without crossing the Torrid Zone. Even if the meat were sent from New Zealand in midwinter it not only has a long trip in the Torrid Zone, but it gets to Europe in midsummer.

Now, it is very plain that meat cannot be carried for a month or six weeks on a steam-ship without preparation. The preparation is very simple; the meat, after dressing, is frozen and it is kept frozen until it reaches the people who eat it. There are refrigerating-rooms at the slaughter-houses, refrigerator cars to the nearest port, and refrigerator ships to London.

Wool is also one of the important products of New Zealand, but it has a much coarser and harsher fibre than the fine merino wool of Australia. As a rule, sheep that are grown for their wool feed on grass; those that are for mutton

get their final feeding on turnips; and all England has said that turnip-fed mutton is good.

Christchurch, a city of about seventy thousand people, is one of the great centres of the wool and mutton industry. The city is there because the great Canterbury Plain is one of the finest grazing regions in the world. Christchurch is not very old—it was made a city in 1862—but it has grown pretty vigorously. Its handsome buildings—churches, college, museum, and school-houses—are as fine as those of any city of the same size anywhere. The streets are wide and beautifully kept, and electric railways extend to half a dozen suburbs.

Out in the suburbs are the large meat-freezing establishments. In the season for export about fifteen thousand sheep are dressed and frozen daily in the great plants in and around Christchurch.

The freezing-rooms are kept at a temperature of a cold winter night. In a single plant there may be as many as ten or fifteen thousand carcasses hanging from great frames, and the walls of the rooms are covered with a thick coat of ice and frost. In three days from the time the meat is put into the freezing-room it will be ready for its long journey.

Wellington is the capital of New Zealand; it is likewise the windy port of the Pacific, for it is in the eye of the "roaring forties," the strong west wind of the South Temperate Zone. But Wellington has the harbor, and the harbor has the shipping; and because of this Wellington is a very rich and prosperous municipality.

On the whole, the New Zealanders have not much cause to envy the people of other lands. Every man and every self-supporting woman can become the owner of a homestead; and about one person in every ten has become a landholder. The government lets them have the land on very easy terms of payment. Women have the same political rights as are

possessed by men. They can vote, hold public office, and hold property in their own names.

The government has established postal savings banks at which any one may deposit money; what is equally good, the money is loaned at a small rate of interest to farmers while they are waiting for their crops. What is still better, the bank never fails, leaving the depositors to whistle for their money.

The government owns and operates most of the railways, telegraph lines, and telephone system. There is good service at a low cost. The government manages and supports all public schools. Attendance is compulsory and practically everything is free from the kindergarten to the university. There are old-age pensions for deserving poor people of good character; there are likewise prisons for those of criminal character—and the two are pretty apt to get together. "Bad" trusts and monopolies have not got the upper hand anywhere in New Zealand and the government sees to it that they do not. Great Britain appoints a governor of the colony, but the people elect a legislative council and a house of representatives.

New Zealand has also something more than productive lands; the colony has plenty of coal fields, gold-mines, silver-mines, iron ore, and copper ore. Even if all the rest of the world were closed against this far-away colony, the New Zealanders could worry along quite well, for they easily rank among the most prosperous and well-governed people in the world.

CHAPTER XXVIII

SAMOA AND FIJI

THE Samoa, or Navigator's, Islands, discovered by a Dutch navigator in 1722, attracted but little attention until the introduction of Christianity in 1830. Only a few of the group are inhabited; the others are chiefly barren rocks.

The islands are of volcanic origin, and earthquakes are frequent, but not severe. Fringing coral reefs form barriers that in a great measure protect the islands from heavy seas. The group lie on the steam-ship route between Australia and the Pacific coast of North America; hence they are important to the United States. The larger islands are mountainous and well forested. Some of the mountains attain the height of five thousand feet.

Early in the '80's there were three rival chiefs, each of whom wanted to be king. As a result, they were at war most of the time, and the property of Americans and Europeans suffered greatly. So, in 1889, Great Britain, Germany, and the United States formed a joint protectorate over them. Ten years later another outbreak was stirred up by foreign adventurers; so the islands were annexed to Germany and the United States for the sake of peace. The two largest, Savii and Upolu, were ceded to Germany; Tutuila and the Manua group were taken by the United States. On condition of having a free hand in the Cook group, Great Britain gave up all claims.

A rich soil, tropical temperature, and a generous rainfall make the islands productive. Americans who live there claim that in no other part of the world can the necessaries of life be obtained so easily as in Samoa. Savii, the largest island, has a smaller area of cultivable land than the others.

Once upon a time, however, it was the most densely peopled and the richest island of all Samoa. Then a volcanic eruption covered much of its surface with ash and lava. Perhaps in time the lava fields may become good soil, as they have in Hawaii.

Tutuila is one of the four islands belonging to the United States; the other three, Tau, Ofu, and Olosenga, belong to the Manua group. All of them together are not half the size of Rhode Island. Tutuila is perhaps the most important island of Samoa, because of its fine harbor, Pago Pago —Pango Pango, the Samoans pronounce it. Pago Pago is certainly a fine harbor. The entrance is so narrow that it can be closed easily; then it widens out into a bay two miles long and nearly half a mile wide. When the Panama Canal is completed, Pago Pago will be right in the track of steamships from Europe and the United States bound for Australia.

Apia, on the island of Upolu, is the port of the Germans. The harbor is larger, but it is not so well protected. In 1889, when a typhoon struck Apia (both the town and the shipping), very few buildings escaped damage or destruction. And the shipping?—well, there was not much left. There were six war-ships and a lot of sailing-vessels in the V-shaped harbor. When the storm raged hardest it seemed to grow a bit more furious. Some of the vessels dragged their anchors and were piled up as wrecks on the beach. Others foundered and went to the bottom with all aboard. Three or four managed to get out of the bay into the open sea, where they were fairly safe.

But Pago Pago harbor is large and deep. What is still better, it is surrounded by bluffs and mountains that will shelter a big fleet against even the fury of a typhoon.

Most of the islands are covered with a dense vegetation, tropical and richly colored. There is an abundance of hard-

wood trees, but the breadfruit, banana, and cocoa-palm are the most useful. The breadfruit-tree grows wild, but it is also cultivated. The fruit is about the size of an ordinary cantaloupe. In some species the fruit is filled with seeds nearly as large as chestnuts and these are sometimes eaten. The best fruit, however, is filled with starchy matter.

It is cooked in many ways, but it is greatly relished when baked in hot ashes covered with live coals. After it is thus cooked, it is cut open and the rich juicy pulp scooped out. When cooked with meat and gravy it is superior to the finest mushrooms.

The cocoa-palm is a source of not a little profit. The thick husk yields a fibre that is much used in making coarse mats; the dried meat of the nut is the copra of commerce. Large quantities are exported to the United States and Europe in order to obtain the oil; and the oil is used chiefly to make soap.

The native Samoans are lighter colored than most Polynesians, and are the finest native peoples of the South Pacific Ocean. Many years ago missionaries and teachers settled in Samoa and they found the natives to be pretty apt scholars. By nature they were dignified and polite; they also learned quickly the arts of civilized life. Nowadays nearly every native village has its church and school-house. The Samoans are fond of music and one may hear American hymns and melodies in nearly every native house.

The native houses are larger than most of the houses one finds among the Pacific islands. Two or more long posts support the ridge pole and a great number of shorter posts hold the lower edges of the roof. The roof itself consists of closely fitted mats of brush thickly thatched with the leaves of wild sugar cane. A well-made roof lasts a dozen years or more.

Mats of sugar-cane closely woven are loosely fastened to

the outer rows of posts so that they can be easily put up or taken down. They form the side walls of the house. The floor is made of clay, paved with pebbles. Usually there is a floor covering of mats. In the centre of the floor is a fire pit which serves for the purpose of cooking during the day and to drive out the mosquitoes at night. The beds and chairs are mats and the pillows are made of bamboo.

The Samoans know how to live well. With each house there is pretty certain to be a garden in which yams, taro, sweet potatoes, bananas, fruit, and chickens are grown. Then, there are fish and shrimps that can be caught in abundance. But the chief and most highly prized dish is called "poi." Taro and kalo are names—or a name, rather; for they are different forms of the same word—given to several plants that grow from starchy bulbs. One kind of taro looks much like a lily that grows higher than a tall man. The bulb, or root, is first baked and then ground to a paste with water. When thus prepared, it is set aside until it begins to ferment; then it is ready to be eaten. A great dish or pot of poi is placed on a mat and the family gather around, one after another dipping it out with their hands. To foreigners poi has a most unpleasant, disagreeable taste. When made into cakes and baked, however, it is much relished by foreigners.

Kava is the national drink. It is made from the roots of a shrub belonging to the pepper family. The root is ground between stones and then soaked in water. After a while it is pounded and rubbed until all the milky juice is squeezed out of it. When "extra-fine" kava is wanted, young girls chew the root until it has become pulpy. After standing a day or two it is strained and is then ready to be drunk. It is a cooling and refreshing drink, but if taken too freely is apt to tangle one's legs uncomfortably.

On account of its delightful climate and beautiful scenery,

Samoa is one of the most attractive places in the world in which to live. Back in the mountains, a few miles from Apia, Robert Louis Stevenson spent the last few years of his life, and his body is buried on the top of the mountain near by. Stevenson was greatly beloved by the natives, and after his death he was mourned by them as one of their very best friends.

Of all the islands in the South Pacific Ocean, the Fiji group is the most important. All told there are more than two hundred islands, but scarcely one-third of them are inhabited, or even habitable. Two of them are large. One, Viti Levu, is about the size of Connecticut; the other, Vanua Levu, is about two-thirds the size of that State. The famous Dutch sailor Abel Janszoon Tasman, whose name is remembered in Tasmania, saw the larger islands in 1643. About one hundred and thirty years later Captain Cook called at Viti Levu and found himself in the midst of a great cannibal feast. In 1840, Captain Charles Wilkes, in charge of a United States expedition, explored them; shortly afterward they became a possession of Great Britain.

The larger islands are great domes of lava built up by volcanic eruptions; many of the smaller ones are coral formations, and all are fringed with coral reefs. Dense forests of tropical vegetation cover the larger islands. Cocoanut and other palms are everywhere to be found. A species of pine, much like the kauri pine of New Zealand, grows on the larger islands. Among the forest trees are also several kinds of tree-ferns and a tree-nettle. When the pointed leaves of the latter prick the skin they sting the flesh as badly as does a wasp.

The English have done well by both the islands and the islanders. They have made the islands yield a good yearly profit to the government itself, but they have also made the natives industrious and contented. When the first British

settlements were made in Fiji, the islanders were in a most degraded condition. They did no work except to grow a few yams, bananas, and breadfruit. Their chief employment was war, and this was carried on, not for conquest, but

Native canoe, Fiji Islands

to capture as many as possible. A few captives were held as slaves, but most of them were fattened—to be killed and eaten at the royal feasts.

Notwithstanding all this there was the making of a very superior people in them; for when the missionaries and the teachers got among them the natives proved very apt pupils. Now there are more than twelve hundred church buildings —and a school-house or two for every church. Some of the ministers and teachers are English, but there are about four thousand native teachers and ministers, nearly all of whom were trained for their work in the island schools.

They are fine farmers, probably the best in the islands of the Pacific. They grow bananas, pineapples, peanuts, and lemons for the Australians, copra and tobacco for the British, and rice, taro, and garden vegetables for themselves. They have learned to irrigate their farms, using open ditches and bamboo mains. They make the finest canoes to be found in the Pacific. Some of the canoes are barges nearly one hundred feet in length; and not even the Hawaiians are more expert in using them.

Not a little profit to the islanders comes from the sea. They are expert divers and gather large quantities of pearl shells, which find a ready market with the button-makers of Europe. Fish are caught, dried, and sold in China. One sea product, the bêche-de-mer, a marine animal commonly called "sea-cucumber," is highly prized by the Chinese, who use large quantities; most of it is gathered by the Fijians.

Sugar, however, is the chief product of the islands, and the sugar plantations are owned by great companies that have invested millions of pounds sterling in the business. The plantations altogether produce more than three million dollars' worth of sugar yearly. The native islanders will not work in the sugar fields; so coolies from India were brought to the islands to work on the plantations.

Suva (Viti Levu), and Leonka (Ovalu), the two largest towns, are much like European cities, except that the houses are low and have large yards filled with shade trees and flowers. In the native villages the dwellings are much like those in Samoa, though a trifle better, perhaps. The side walls are covered with plaited reeds, and the roof is thatched with palm leaves securely fastened. In the lowlands it is customary to build a platform of rock upon which the house stands and into which the foundation poles are set. This is done for two reasons: when a typhoon sweeps over the

islands, the lowland coast is sometimes flooded; moreover, the wind blows with such terrific force that none but the most strongly built house will withstand it.

In the centre of the floor is a pit, or fireplace, much like the cooking-place one sees in Samoa or in Hawaii. Chickens and pieces of meat to be roasted are hung from a frame over the pit. Yams and other vegetables are boiled in earthen vessels which the native potters make. The floors are covered with closely woven mats; and in order to keep them clean an earthen vessel filled with water is kept outside so that whoever enters the house may bathe his feet. Inasmuch as the natives go barefoot one may see the usefulness of this custom.

Great Britain has many islands in this part of the Pacific; Gilbert, Ellice, Tonga, Cook, and some of the Solomon group all fly the Union Jack. There is an English governor, or "High Commissioner," as he is styled, who looks after British affairs in the islands. In Fiji he is the real governor, but in many of the islands native chiefs and kings govern their peoples about as they please, provided they do not interfere with British interests.

CHAPTER XXIX

THE HAWAIIAN ISLANDS

ALMOST midway between the United States and China a mountain chain more than three thousand miles long crosses the tropic of Cancer. Only the highest peaks, however, reach above sea level; most of the range is fathoms deep in the waters of the Pacific. The eastern end of this great chain constitutes the Hawaiian group of islands, or the Territory of Hawaii.

Altogether they are pretty nearly as large as the State of New Jersey, or five times the size of Rhode Island. All the islands are very rugged in surface—steep and high cliffs, deep valleys and canyons, and stupendous craters that have vomited great floods of lava. A little way from shore the Pacific has some of its deepest beds. If the sea could be removed the island of Hawaii would be a great dome five miles high.

The coral polyps have added their mite to the building of these islands, and coral reefs are the foundation of the coast plain that surrounds a considerable part of the girth of each.

An equable climate throughout the year, a soft and balmy air, brilliant coloring on bush and tree, magnificent pictures of sea and sky, and of mountain and plain, make the islands a veritable paradise.

It is thought that these islands were peopled by Samoan natives about the year 600, and that subsequently their number was augmented by emigrants from the Fiji and other southern islands. At first there was plenty of land for all, but as their number increased, quarrels arose. Each island had its king or chief and some of the larger islands had two or more. The result was a condition very much like the feudal system; each king had petty chiefs, and these, in turn, their retainers, who were little better than slaves. Priests, who ranked equal to the petty chiefs, directed their pagan worship and occasionally made human sacrifices.

The kings were pretty apt to be at war with one another most of the time, but, about forty years before the American Revolution, there came a great soldier and leader, Kamehameha I. By the aid of European weapons and the counsel of foreign friends, he overcame his rivals and brought all the islands under his sway.

The Hawaiian Islands were made known to the rest of the world when that plucky English sailor, Captain James

Cook, was making his third and last great voyage of discovery, in which he had set out to find the famous and tragic northwest passage. On a roundabout way to Bering Strait, he called at the islands which seemed very attractive to him. Perhaps it is not quite right to say that he

General view of Volcano House, Kilauea, Hawaii

discovered them, for it seems very probable that the Spanish explorer Gaetano discovered them in 1555.

It was 1789 when Cook first visited the islands, and after he had continued his voyage through Bering Strait, and had failed to find the northwest passage, he turned about and sailed for the islands. While ashore with a part of his crew at a landing that is now the village of Kealakekua, one of the ship's boats was stolen by natives.

Now Cook had learned to manage South Sea islanders in a very practical, though not the most tactful, way. When trouble occurred he used to send out a strong landing party, seize the king or chief and take him aboard the vessel—a

proceeding which usually brought the natives to terms. But at this particular time the landing party was driven to the boats and Cook was killed.

The group of islands was first named after Lord Sandwich, a patron and friend of Cook. At the time of Cook's discovery of the long-forgotten islands it was estimated that their population was not far from four hundred thousand. Missionaries went to the islands early in the nineteenth century and their reports brought many Americans and Europeans who settled there permanently. Then the chief business of the islands was the ordinary trade with the many whaling vessels that were in the Pacific.

For a time the islands were under the protection of Great Britain; then they became an independent kingdom. When it was found that the lava fields made the best sugar-growing soil in the world, American capital came in millions of dollars to be invested in great plantations of sugar cane.

Trouble between the queen and American business interests became so serious in time that the queen was dethroned and the Republic of Hawaii was established. The republic was short-lived, however; for when the Spanish-American war occurred, it was seen that Hawaii is the key to the Pacific Ocean. The Hawaiians, foreigners and natives, had long wished to become a part of the United States. So the islands were annexed and shortly became the Territory of Hawaii.

There are six large islands—Hawaii, Maui, Oahu, Molokai, and Lanai. There are many small outlying islets, most of which are not inhabited. Wireless telegraph stations connect the principal islands; an ocean cable ties the Territory to San Francisco; and steam-ship lines carry on commerce with British, Japanese, and American ports. Even the railway-builder has not forgotten Hawaii, for there are not far from two hundred miles of railroad, about half of

which carry the products of the sugar and coffee plantations to the near-by ports.

Hawaii, the largest island, is famous for its great volcanoes, Kea, Loá, and Kilauea. From the village or city of Hilo comfortable coaches take visitors over a fine road

A lake of white-hot molten lava. The volcano of Mauna-Loá, Hawaii

clear to the crater of Kilauea. At times one may stand on the edge of Kilauea's rampart and look down on a lake of white-hot, molten lava three miles long and half as wide. Every now and then bubbles of gas or steam come to the surface and exploding send long threads of viscous lava into the air. Some of the glassy threads are fine as the finest silk and a blast of air carries them off to the cliff; Pele's hair, they call it, and the sea-gulls gather it to make their nests.

The highest points of Hawaii island are nearly fourteen

thousand feet above sea level. Below the line of about ten thousand feet easterly winds bring an abundance of rain; above that line westerly winds bring occasional showers and snow squalls. As a result one may find places only a few miles apart, one of which has almost daily rains while the other gets none at all along the lowland coasts.

Oahu is the best-known island because of Honolulu, the capital of the Territory. A most beautiful city it is; indeed, there is nothing elsewhere to surpass it in attractiveness—wide streets, beautiful parks, flower gardens of wonderful plants, fine dwellings, electric street cars, good government, and schools that are famous. All these things make Honolulu one of the most desirable and attractive cities of homes anywhere in the world.

Just back of Honolulu is a volcanic peak with its great crater—the "Punch Bowl," they call it, because of its shape. As one looks down from the rim of the Punch Bowl the city is half hidden among its palms and algeroba trees. Above the trees are the domes and turrets of the National Palace, the government building, and the school-houses. In the distance here and there are the great plantations—sugar, rice, and banana.

In the city streets one will see the people of many lands—Germans, English, Americans, native Hawaiians, Chinese, Japanese, Koreans, Malays, and Hindoos. Many of the native Hawaiians are rich and prosperous; some are in business, and others are in professional life. Many of the Chinese are well-to-do merchants. The Hindoos, Malays, and Japanese were brought to Hawaii to work in the great plantations.

In the native villages one will frequently find a little church building and almost always the district school. Perhaps there may also be a Chinese store. Black-eyed children are running about dressed in long gowns, and some of

them carry little bundles of school-books, each tied with stout cord or a leather strap.

The Hawaiians will not work in the sugar and the rice fields, and not many will stand the easier labor on the coffee plantations. In cultivating their little patches of bananas, breadfruit, cassava, and taro, however, they are pretty industrious. When the time of the royal feast comes, the natives, or "Kanakas," as they call themselves, get busy. The feast certainly is a royal one. Roast pig and roast chicken are smoking in a dozen dirt ovens. There are steaming yams and sweet potatoes by the bushel, great piles of all sorts of fruit—and poi. All the rest of the food is commonplace; poi is *the* dish. It is one-finger poi, two-finger poi, or three-finger poi, according as it is thick enough to be lifted out of the pot sticking to one finger, or so thin as to require a dextrous swish of two or three.

Waikiki is the great resort of Honolulu. There is the finest of bathing the year round; and what is more interesting, the native surf swimmers. With a piece of plank just large enough to support his weight in the water, the bather swims out to the reef in still water. Then he, or she—for young girls are most expert swimmers—makes for open water, where the combers are forming. Then, lying flat, bather and plank are borne along on the swift rolling surf until both are tossed high on the beach.

The aquarium is famous for its unique collection of fish and marine animals; it is one of the finest in the world. Near by is the race course and amphitheatre. What is still better is the winding road through ferns and flowers that leads to the crater rampart, Diamond Hill.

Half a dozen miles west of Honolulu one goes by rail around the shore of Pearl Lochs, or Harbor. Pearl Harbor is large enough and deep enough to float all the warships Uncle Sam will ever own, and the possession of this

magnificent site for a naval station was a very strong inducement to annex Hawaii.

Less than one hundred miles away, at Kalaupapa, on the island of Molokai, is the leper settlement. Years ago Chinese settlers brought the disease to Hawaii; then the natives began to be stricken, and when it was found that leprosy was spreading, the lepers were sent to Molokai. For many years they had but little care; the government fed and clothed the poor victims and that was about all.

In 1873 Father Damien, a plucky Catholic priest, went to Molokai and thereby made himself practically a prisoner for life. Father Damien procured physicians, trained nurses, and the best possible care for the lepers, and they could at least die in comfort if they could not live. Then Father Damien himself was stricken and died. By this time, however, the government took the matter in hand. A fine hospital was built and a laboratory for the study of the disease was established. Those who are able to work can partly support themselves, and they are far better off when busy than when idle.

In 1848 the "Great Division" took place; that is, the lands for the king, for the public domain, and for the people were set aside, so that the people who so desired could own their farms and dwellings. At that time the islands were important only as a calling place for whaling vessels. At the present time Dame Nature is made to yield annually not far from one hundred million dollars' worth of products—sugar, rice, coffee, fruit, and cattle. A few years hence, tobacco, rubber, cotton, and honey will be added to the list of exported products.

Americans own the sugar plantations, which are mainly on the lava fields of Hawaii, Oahu, and Maui Islands. The Chinese and Japanese cultivate the rice along the coast low-

lands of Oahu and Kauai. Sheep and cattle are grown on Lanai and Niihau.

Uncle Sam has brought some very valuable additions to his public domain, but no investment has paid better than Hawaii, the Paradise of the Pacific.

CHAPTER XXX

GUAM

WHILE cruising in the Pacific Ocean Magellan discovered a chain of islands about fifteen hundred miles east of the Philippine group. While he lay at anchor, predatory natives stole some of his belongings; thereupon Magellan gave them a bad name, and to this day the islands bear the name Ladrones, or "thieves" islands.

Guam, the largest island in the group, became more or less important just after the Spanish-American War, inasmuch as it was required as one of our chain of naval and coaling stations that pretty nearly encircles the earth. As islands go, Guam is of fair size, about thirty miles long and from three to ten miles in width. It is mountainous and the surface is jungle-covered except where the natives have made trails and clearings. Fringing coral reefs, broken here and there, encircle the island. One of these breaks is opposite a bight in the coast, San Luis d'Apra, or Apra, as it is now called; and the bay and channel together form a harbor so well guarded that no transport laden with hostile troops would ever attempt landing.

In 1668 a mission was established. At this time the population numbered about one hundred thousand. The country was so well cultivated that the whole island seemed like a beautiful garden, for the people were pretty good farmers.

Rice and tropical fruits were cultivated in abundance. The natives were also skilful in the making of pottery and they had a well-regulated calendar.

For a time they were well disposed toward their intruders; but at length, as they began to learn that conversion to the Christian faith meant also slavery to the Spanish, they rebelled against a system which was so one-sided, and their opposition led to constant strife and bloodshed.

In the course of time the severe treatment of the Spaniards, together with contagious diseases introduced, so completely wiped out the native population that, at the end of seventy years, scarcely two thousand were left. Perhaps no peoples in all the South Sea Islands have suffered more keenly from contact with Europeans than these aborigines.

Frightened at the terrible mortality they had caused, the conquerors turned to the Philippines to replenish the depopulated island. Tagals were brought over to occupy the place of the fast-disappearing natives, and with these many of the natives intermarried. The half-castes are inferior to the original inhabitants, but they have increased in population, and now number ten thousand.

Spain ceded Guam to the United States in 1898. Since the acquisition our government has established both day and evening schools for the natives, and they are making rapid progress in education.

It is a long journey to Guam—thirty-five hundred miles almost from Honolulu and not quite half as far from Manila. And how to get there? Well, it is not an easy matter. If you go to Apia, or to Manila, and remain long enough—perhaps six weeks, maybe six months—a German trading schooner will come along and take you aboard. You get there in time; for the trading schooner is likely to make a very circuitous trip, calling at a dozen islands to get copra in exchange for cloth, knives, and cheap jewelry.

But if one happens to have the right sort of "pull," one can get a pass on an army transport. That means a most delightful trip from San Francisco to Honolulu, and thence to Guam. Uncle Sam does the square thing by his soldiers, and the army transports that carry them to the distant

Native ploughing in rice-field, Guam. One may find rice-farms as skilfully cultivated as those of Japan or China

stations are fitted so as to be as comfortable as the best liners. There are a big exercise deck and a reading-room with plenty of books. Not the least important part of the equipment is a self-playing piano and a good assortment of music.

There is not very much to see after one reaches Guam. One village is just about the same as all the others. Perhaps half a dozen huts are built of mud, or possibly of coral limestone; the rest are made of bamboo frames covered

with palm—all in one room in which the family and the pig live.

Agaña, however, is a village of six or seven thousand people. It is laid out in streets which are fairly regular. They are deep with dust during the dry season, and with mud the rest of the year. There are several government buildings which are neat and trim, two or three churches, several school buildings, and a few stores. Most of the people one meets on the street speak Spanish; a few speak English. English is the coming language, however; for the schools are there to stay and every one of the fifteen hundred youngsters who attend school carries away a little English. A fine road bordered with palms connects Agaña with Apra, seven miles south.

There is not much to see in Guam. The scenery is much like that of every island in that part of the Pacific. About the only diversion of the soldiers stationed there is hunting, which is pretty good if one is content to hunt deer and wild hogs. Artistic sportsmen might prefer the deer, but all the real fun is the share of the hog-hunters. The hogs are savage beasts when cornered; they likewise are full of animal cunning.

Along the coast lowlands one may find rice-farms as skilfully cultivated as those of Japan or of China. Most of the rice is consumed on the island; however, copra, or dried cocoanut, is an export, and its sale brings enough money to the natives to purchase the cloth and other goods needed. Since American occupation the caçao tree has been cultivated, and cocoa bids fair to be the chief export in the near future.

The government of Guam is better under American rule than at any time in the previous history of the island. When the late Admiral Schroeder was governor of Guam he consulted his log-book and discovered that he was altogether

too far away from Washington to be tied to rules and regulations, or to be tangled up in official red tape. So he cut the tape and used good common sense instead. Perhaps the government was a bit patriarchcal, but it was good, clean, and wholesome—and every one profited by it.

CHAPTER XXXI

THE PHILIPPINE ISLANDS

OUR newest possession, the Philippine Archipelago, in a way, is also our oldest, for the islands were discovered by Ferdinand Magellan in 1521, about twenty-nine years after the great discovery of Columbus. Magellan called at several islands, among them Mindanao and Cebú. He anchored in the harbor on which the city of Cebú now stands. He seems to have been treated in a very friendly manner by the natives of Cebú, but when he crossed to a near-by island he was attacked and killed. The friendship of the King of Cebú was not very steadfast, for after Magellan's death several of his officers were put to death by the king's order.

For two hundred and forty years the islands were a possession of Spain; then they were captured by a British fleet. They were soon restored to Spain, however, and remained a Spanish possession until 1898, when they were ceded to us after the Spanish-American War.

There are more than three thousand islands in the archipelago, and they are the partly covered tops of a mountainous and rugged plateau. Many volcanoes testify to the volcanic origin of the plateau; indeed, the surface of the plateau seems to be a thin crust over—well, over trouble; for the dozen or more volcanoes are never quiet long enough to be forgotten. Perhaps it was proper to name the islands

after Philip II of Spain, for he, too, had his full measure of trouble.

The archipelago is of pretty good size. The whole plateau, land and water, is about as large as that part of the United States east of Chicago; and the islands themselves are pretty nearly as large as the State of Texas. Luzon, the largest island, is about as large as Pennsylvania, and Mindanao is a bit smaller. Then there are Samar, Panay, Palawan, and Cebú—every one large enough to make a State of fair size, and every one with enough people to make a State.

There are about seven million people all told, most of whom are of the Malay race. As a rule, they are pretty well along toward civilization; some of them are educated. There are also tribes of the black race—Negritos, they are called—who are just plain savages. They are the original inhabitants of the islands, and it is most likely that they are the descendants of people from New Guinea. In the southwest is the Sulu group, inhabited by Malays, called Moros. They are Muhammadans in religion and are the last of the Malays who came to the islands.

Of all the Malay peoples, the Tagalogs of Luzon have been the foremost to learn the arts of western civilization. They have surpassed their near relatives, the Visayans, who live in the central part of the islands. Perhaps it is the closer contact with the Spanish that has given the Tagalogs their great progress. At all events they have become well to do and prosperous as measured by other Malay peoples.

The Moros, who live mainly in the southern part, have scarcely reached civilization. In the Sulu islands they have their own government, at the head of which is a native sultan. In many parts of the islands there are tribes governed by chiefs called "dattos." Some of the natives are prosperous farmers, but many of them are savages.

A great deal has been said about the misrule and cruelty of the Spanish governors and officials. Being soldiers and taskmasters it is likely that they did many things that will not stand the searchlight of civilization. But the work of the priests will always leave a pleasant flavor. For three

The carabao, harnessed to a dray or wagon, shuffles along

hundred years they braved every danger and suffered every hardship in their work. For every one that fell a victim to disease, or to the bolo, there was another ready to fill his place. They not only converted the natives to Christianity, but they also taught them to be thrifty farmers and prosperous business men. As a result the Filipinos are the only Asian people of considerable numbers that have yet become Christians.

When the Philippine Islands became a possession of the United States, one of the first things done was to establish several thousand schools. A thousand American teachers

were at first employed. Training schools for teachers were established, and in the course of a few years more than five thousand Filipino teachers were conducting native schools. English is taught in all the schools, and there are special schools in which agriculture, mechanical trades, and commerce are taught.

There is good reason for all this, for the islands have wonderful resources. Gold, silver, copper, and iron are abundant. The forests have an abundance of hard woods that sooner or later will find a market both in Europe and America. The rice-fields will easily produce enough grain for the whole population, and a considerable amount to sell in addition, when all the rice-lands are cultivated. For want of good wagon roads and railways only a small part of the rice-lands are cultivated.

There is an abundance of good grazing land that will produce meat for twice the present population. Most of the cattle now grown in the islands are of the kind found in India.

The most common beast of burden, however, is the carabao, or water-buffalo. What an ugly looking beast it is! It is as clumsy as a hippopotamus, as ugly as a rhinoceros, and as kind and gentle as an old muley cow. Harnessed to a dray or a wagon, it shuffles along, its big, flat feet seeming to walk all over the road. But those same big feet are the animal's chief stock in trade. They enable him to walk through both sand and deep mud—mud so soft and deep that a horse or a mule would sink to its body. Nothing but the carabao's flatboat-like feet could drag ploughs through the soft mud of the rice-fields.

Carabaos are easily trained to farm work, and even children can drive them—or ride on their backs in going to school. The milk of a carabao is as good and wholesome as that of an ordinary cow; the meat is pretty tough, but it is not unwholesome.

One thing, however, the carabao must have, and that is a bath several times a day. Deprived of its bath, the animal at first becomes restless; then it breaks away in a half-crazed condition for the nearest water, where it buries itself, all but its head. Native drivers know just how to manage their animals and drive them to the nearest water several times a day.

There are horses in the islands, but not many. Most of them are very much like the mustang. The Spanish brought Andalusian ponies to the islands many years ago, but they did not prove very useful. Within a few years American horses were introduced, but they could not live on Philippine grasses. Mexican mustangs and Mongolian ponies were much better, however, but they are used chiefly as riding animals.

Of all the beasts of burden in the Philippine Islands, none is in the same class with John Chinaman. Everywhere his bland smile is seen; his patience has no end—and, apparently, his work has none. The Filipino farmer works merely to keep body and soul together; John Chinaman works to save hard cash, and he saves it. Wherever there is any money to be made, John is pretty certain to be near by. He is the cook and "maid-of-all-work" in the house of the foreign resident, the stevedore on the dock, the clerk in the forwarding house, the "boss" in the rice plantation, the handy man in the tobacco factory, and the store-keeper in the remote Filipino village. Sixteen hours of hard work every day and Sunday seem to make him grow fat; the rest of the time he just works for fun—and hard cash.

Long before the Chinese coolie came to the United States the Spanish raised the cry "The Chinese must go." The Spanish made short work of them, killing them by thousands and tens of thousands. But in a year or two John was on hand again, smiling and working sixteen hours a day—

strictly for cash. And he is in the Philippine Islands to stay.

As a rule the Filipinos rarely live isolated as do the American farmers. Almost always they cluster in villages of one or two hundred people. The Filipino is not likely to cultivate a big farm. Two or three acres will supply the family with all the food required, and the Chinese merchant will buy enough of his produce to provide a few dollars in cash and the cloth for the family wearing apparel. In the smaller villages there is an open place that answers for a street, but the houses are apt to be scattered about without much regularity of arrangement.

The houses, like those of the Pacific islands generally, are built of bamboo frames—heavy pieces for the framework itself and woven bamboo splints for the side sheathing. The roof is carefully thatched with the leaves of the nipa-palm and these are sewn into a thick mat with ratan. In places where the ground is likely to be overflowed, each house is set on posts so that the floors are several feet from the ground. In this case the "pig" does not "live in the parlor"; the pigs and chickens occupy the "ground floor." All told, the Filipino village mansion may not be very ornate, but it is extremely comfortable.

The larger villages and cities are built much alike. There is a plaza or public square. Around the four sides, and facing the plaza, are the church, government buildings, and stores. The more pretentious residences are near by. Further away these give place to the Filipino, or "nipa houses," as they are called. The street surrounding the plaza is broad and well kept; elsewhere the streets are quagmires in the rainy, and dust holes in the dry season. Pretty nearly always there is a Chinese quarter that is crowded and dirty; quite likely, too, the best stores in the town are kept by Chinese merchants. That is the way the Spaniards laid

out their cities and towns in Spain; they did not change the plan in the Philippines. The houses built for them in the islands are much like those in Spanish towns—adobe walls plastered with stucco, and roofed with tiles.

Manila is the capital and commercial centre of the islands. It is a city about as large as Seattle, and is situated at the

The harbor of the city. Scene on the Pasig River, Manila

head of a landlocked body of water, Manila Bay. Corregidor Island, a little dark-green islet, guards the entrance to the bay; and one cannot see the wicked guns that are ready to pour a raking fire into a hostile fleet until one is within a few hundred yards of the island. The only thing visible at a distance is a flag flying from a high mast; but it is the Stars and Stripes that bends to the east wind. The bay is a good-sized bit of water, too. In the middle of it one can just barely see the gray, misty hills that surround it.

Then the shore line begins to take shape and the mouth of Pasig River seems to open in front of the incoming steamship. In a few minutes the harbor of the city is in sight. Steamships, with their painted stacks and funnels, and sailing vessels, with every sort of mast and rigging, crowd the harbor. Row-boats by the hundred are moving in every direction, and little steam-launches and motor-boats are spitting viciously as they go back and forth.

The lower part of the city is almost like Amsterdam; it is traversed by canals, great and small, in which are fishing-smacks waiting to have the catch taken to market. Puffy, wheezy tugs are making fast to huge cascoes, or lighters; for the cargoes must be taken from the docks to the steamships and sailing-vessels out in the harbor.

The Pasig is only ten or twelve miles in length. It flows from a near-by lake, and both sides of the river are lined with villages, and market-gardens, and duck-hatcheries.

The business streets are crowded with carts and drays. Here and there are smart-looking carriages carrying well-groomed men, who talk little and look rich. There could not be more style and ceremony about them if they were in New York, London, or Paris. Trim-looking soldiers in khaki uniforms, native Filipinos in white suits, Chinese in silk gowns and long sleeves, native women wearing red skirts and black shawls, native coolies in loose blouses and short pantaloons—all go to make up the throng of the streets.

Most of the houses are two stories in height with arcades or awnings that shelter the sidewalks. And such narrow sidewalks!—they are hardly wide enough for more than three people to walk abreast. But even the business houses are built for comfort. The roof has a broad overhang, and quite likely there is a covered veranda.

Many of the Filipinos of Manila are educated and prosperous. Their houses are said to be furnished in European

style, and likewise their clothing. Sure enough everything bears a "made in Germany" mark, but everything looks distinctly Filipino. The head of the family wears a suit of spotless white duck, but it has a military cut—and perhaps

Extracting indigo in Ilocos Province, Philippine Islands

he goes about the house barefoot; if so, he knows what real comfort is.

Mother and daughters wear skirts of beautiful brocaded silk, very wide and full; above the skirt is a loose garment much like a shirt-waist cut low at the neck, and over this a lace cape with a wide, flowing collar. Possibly they wear heelless slippers, but just as likely they, too, are barefoot—when no visitors are present. Perhaps such suits are not quite so becoming as the trig, tailor-made suits in New York, but they are a lot more comfortable.

A short distance from the Escolta, or chief business street,

is one of the many markets of Manila. The whole space is laid off with rows of bamboo booths. Pretty nearly everything to eat, to wear, or to furnish the house is on hand—or rather in loose piles—fish, duck's eggs, meat, rice, pinole, fruit of forty kinds, straw hats, straw sandals, straw raincoats, tin ware from America, wooden ware from Holland, and clay stoves "made in Manila."

Every alley has its own wares, and John Chinaman with his baskets balanced on a long pole puts a finishing touch to the market. A Filipino cannot be emphatic in an ordinary tone of voice. Buyer and seller work themselves up to high C pitch until it seems as though nothing short of a fit would overtake both. Bedlam is turned loose in every part of the market. Usually a man and his wife are required to conduct the business at a booth. Their bare feet sticking out from the skirts bob up and down, beating time to the clatter of their voices.

Here comes a man whose sole stock in trade consists of a single article, namely, a python. His goods are twined about a pole with a cross piece for a perch, but the snake's tail has a loving twist around the owner's neck. What for? —well, the python has a sweet tooth for rats and mice and the sweet tooth of this particular snake is on edge for a square meal. Years ago foreign ships brought rats from various countries. In the course of time rats and mice became so numerous that it became a question whether Manila should exterminate the rats or the rats exterminate Manila.

Now, those same ships ought to have brought some cats along, too. But it is just as well that they did not, for one python is worth half a dozen cats or rat terriers when business is on hand. The only drawback occurs when the python insists on getting into bed with his owner to keep warm.

When in Manila, go to Duck-town by all means. It is

only a short distance from the near-by market. The feeding grounds and hatcheries extend for two miles along the river. Hundreds of thousands of ducks are reared at the hatcheries, some for eggs, and others for food. The ducks

Manila hemp as it is brought in from the country

are fed on shell-fish, and foreigners imagine that both the meat and the eggs have a fishy flavor. Eggs and edible bird's nests are also brought from neighboring sea-cliffs to the Manila markets; and both are considered great delicacies.

Manila is the largest city of the Philippines, but there are also several other cities of good lusty growth. Bauan, Lipa, Laoag, and Batangas—all in Luzon—and Ilo-ilo in Panay are growing in population and business as the re-

sources of the islands develop. Since the American occupation, Uncle Sam has done a great deal to make these ports centres of business; harbors have been deepened; railways have been extended; good roads have been built; and rivers have been made navigable.

There are several exports that will always tend to make the Philippines rich. Tobacco is an important crop and the Manila leaf, as it is called, is of very fine quality. There are those who whisper it about that much of the leaf is shipped to Cuba to be made into "Havana" cigars. Sugar is also a great export crop, and when the railways now under way are completed sugar will become one of the foremost exports. The export of copra, or dried cocoanut, is a leading industry, and the Philippine Islands produce a large part of the world's product.

One Philippine product, however, connects the islands with almost all the rest of the world, namely, Manila hemp. That is, it is called "hemp," but it is not hemp at all; the fibre is obtained from a plant very closely related to the banana. White leaves or husks grow closely around the stalk of the plant, forming a tightly fitting case. This envelope is composed of thousands of long, strong fibres that, when cleaned and dried, are the hemp that makes the strongest and best rope in the world.

After the pulpy leaves are stripped from the stalk, the pulp is squeezed out of them and the fibres are left in the sun to dry. The best fibre is as soft and fine as silk. Some of it is used in making a fine cloth; the coarser fibre is used for rope and hawsers. More than fifteen million dollars worth of Manila hemp is sold yearly.

In the treaty with Spain, by which Uncle Sam acquired the islands, twenty million dollars was paid to Spain. But the exports from the Philippines have averaged nearly thirty million dollars a year ever since.

CHAPTER XXXII

THE DUTCH EAST INDIES—JAVA

THE East India Islands is a name which embraces nearly all the islands of the Malay Archipelago, together with the Philippines. The largest of these are New Guinea, Borneo, Sumatra, Celebes, and Java. Nearly all of them, except the Philippines and parts of New Guinea and Borneo, are controlled by the Dutch. These fertile islands are a source of great revenue to the Netherlands; to the rest of the world they are the chief source of sugar, spices, and coffee.

Of all the Dutch East Indies, Java is by far the most beautiful and productive; it is a garden of the choicest fruits and flowers.

There are two seasons, a wet and a dry. During the wet season the torrential rains are accompanied by thunder and lightning. In some parts of the island more than a hundred thunder-storms occur yearly. The average rainfall is from sixty to one hundred and eighty-five inches, most of the rain falling on the windward side.

Many of the streams are perennial, and their waters are conducted away to be used in irrigation, thus bringing under cultivation nearly every part of the island. Moreover, the streams themselves hold fertilizing material much of which has been thrown out by volcanoes. The irrigating water itself furnishes sufficient enrichment for the soil, and but very little fertilizing is required. The heat, moisture, and fertile soil, coupled with skilful farming, produce bountiful harvests and make the whole island a smiling field of verdure and plenty.

The hills and mountains in many places are terraced, so that at a distance they look like gigantic staircases carpeted

with bright green. So fertile is the soil that in some places two or three crops are raised each year.

About one-fourth of the surface is covered with forest. Among the most valuable trees is the teak-wood, which is extensively used in ship-building. It is a more durable timber than oak, since it resists decay for a long time, even when wholly or partly submerged in sea water. There are vessels afloat to-day which were built of teak one hundred years ago.

The inhabitants, about thirty million in number, are of the Malay race and belong to three nations, speaking closely related but different languages—the Sundanese, Javanese, and Mandurese. The island was wealthy, populous, and had a high degree of civilization long before it was known to Europeans.

Long years ago—twelve hundred or more—the Hindoos invaded the country, and in the fifteenth century Muhammadans came. They were followed later by the Dutch who first gained trading concessions and then gradually got possession of the whole island, much in the same way as England secured India. Each conquest left its impress on the people; the Muhammadans converted the natives to their religion. Buddhism preceded the religion of the great prophet, and some of the teachings of Buddha have been retained, together with many pagan customs.

The Dutch wisely made no effort to Christianize the natives and, until recently, they have discouraged all such attempts, believing that they could control the people better without disturbing the prevailing religious conditions. Indeed, they manage affairs with the natives wonderfully well.

The island is divided into "residences," in each of which the laws are administered by a native governor. A Dutch resident is employed by the colonial government to assist

the native governor—really to see that he manages his people justly and fairly, for strict justice has always been observed in dealings with the natives.

The Dutch residents are called "elder brothers." Each

A breadfruit tree in Java

resident watches his residency with great care to see that the taxes are collected and paid to the government, and that the natives are treated with justice. He is usually the judge who settles all family quarrels and disputes between neighbors. He is just in his judgments and his decisions are

not questioned. Affairs are managed in much the same way as the "School City" or the George Settlement in the United States.

At the same time the Dutch are very careful to impress their authority on the natives. They require the natives to pay great respect to all officers of the colony. A native who comes into the presence of an official must have his head turbaned and his attire in proper form. Under no circumstances is he permitted to smoke, chew betel-nut, or behave carelessly.

The daily work of the natives is very carefully supervised. They are taught where to plant, what to plant, and how to plant their crops. The "elder brothers" also see that the crops are cultivated with care and properly harvested.

Java is ruled by a Governor-General and a council appointed by himself. The officers are selected because of their fitness, and most of the subordinates must pass a civil service examination. Once in the East India service an official is fixed for life, and when he has served his time he retires on a pension. Most of the pensioners prefer to remain in the island the rest of their lives.

The officials and, indeed, all European residents live well. Stone houses with marble or tile floors, wide verandas, and large gardens are the rule. Breakfast at one o'clock is the substantial meal of the day. It marks not the beginning but the end of the day's work. From one to five the intense heat keeps every one indoors. At five, official Java and all other Europeans bathe, dress, and get ready for dinner. After dinner, driving, calling, and gossiping at the clubs is the proper thing, and nowhere are people more ceremonious.

The natives have but little ambition and no desire to do anything for themselves. Now and then there are exceptions, however; and a native may be found pegging away

at the studies that will enable him to pass the examinations and hold an official position.

As a whole, the native is gentle and polite and yields ready obedience to those in authority. He is fond of amusement, feasts, and gambling; he, moreover, celebrates every possible event—his marriage, the birth of his children, the building of his home, the rice harvest, a return from a journey, a recovery from illness, and even the filing of his teeth. If he, perchance, has not sufficient money to hold the celebration, he can join with a neighbor, then both will share mutually the expense. On all occasions his deportment is quiet, and whether moved by joy or anger, no loud language or boisterous laughter is ever heard.

The marriageable age of girls is from twelve to fourteen years, and that of boys sixteen. The night preceding the wedding must be spent by the couple in watching, in order to avert subsequent unhappiness, and the next day they repair to a mosque and are married according to Muhammadan rites and customs. To symbolize her total submission to her husband, the wife washes his feet. Unfortunately, a divorce can be obtained by the husband for a trivial cause by the payment of a small fee. A native, on being asked why he got a divorce from his wife, replied, "She ate too much and I could not afford to keep her."

Early in the morning the highways are thronged with people on their way to and from the markets. And the markets?—well, one is certain to find John Chinaman in charge. As a matter of fact, there are more than half a million Chinese in the island, and they have the control of the trade with the natives. But the native Javanese trudges along, balancing two baskets on a long bamboo pole. Women and girls help to make up the throng, and they, too, are laden.

At the market pandemonium seems to be loose, and both buyer and seller are shrieking at the top of their voices over

a bargain price. There is no question as to which wins; the Chinese merchant is there for business. When the native receives the pay for his produce quite as likely as not he makes for the nearest gambling-house and in half an hour loses the savings of a month.

To the natives the greatest terrors are lightning and tigers, both of which claim hundreds of victims each year. They often refrain from killing the tigers, since the tigers kill the wild pigs which destroy their crops.

The tiger is killed usually by capturing him in a sort of box-trap, and then the trap is taken to the nearest stream, where it is submerged and the animal drowned, to avoid injury to the skin, which brings a good price. The claws and whiskers are carefully removed and sold as fetiches, since they are considered to be very efficacious.

Notwithstanding their hard lot, the people seem happy and there is no starvation poverty. They and their ancestors from time immemorial have always worked hard under task-masters and they know of no better condition. Since their scanty clothing costs but little, if they can have enough to eat and a little amusement occasionally, they are content. When they have money they spend it recklessly, regardless of the future. If the needs of the present are supplied, that is sufficient. When misfortune or disaster overtakes them they merely say: "It is the will of God."

The temples built centuries ago are among the most wonderful structures in the world. They vie in size and grandeur with those of India. Thousands of these ruined temples are found scattered everywhere over central and eastern Java, and many of them are built on the slopes and summits of mountains. These ruins give evidence of the wonderful skill in sculpture and building attained by the people in by-gone ages, a skill not excelled even in modern times, but lost to the present inhabitants.

The ruins of the great temple of Boro-Bodor, situated in the south-central part of Java, are among the largest and most striking in the world. This temple is square and was built in six terraces or steps on the summit of a hill. The first terrace measures about five hundred feet on each side, while each of the five decreases in size toward the top. The last one is crowned by a cupola fifty-two feet in diameter, surrounded by sixteen smaller ones.

Here in this great temple of the dead past may be seen scores of statues, showing on their countenances the peace of Nirvana. On both inside and outside of the structure are hundreds of images of Buddha and carvings of scenes connected with his life. It is estimated that all of the sculptures occupy an extent of wall at least three miles in length. All the figures are carved from large blocks of lava.

This wonderful temple is built of lava blocks without lime or mortar, the huge stones being jointed most accurately by tenons, mortises, and dovetails which bind them solidly together.

Many of the temples erected by the Buddhists and Brahmanists were destroyed by the Moslem invaders, and others abandoned. All of these edifices became, during the succeeding centuries, overgrown with the luxuriant tropical vegetation and partly buried. Some of them, like that of Boro-Bodor, have been uncovered, displaying hundreds of statues and long lines of bas-relief.

Java is one of the most productive regions of the world, otherwise thirty millions of people could not live there. The greater part of the islands consists of government plantations, but there are more than twenty thousand private plantations. The Dutch government has built fine wagon roads and miles of railways, otherwise the great crops of rice, sugar, coffee, and tea could not be moved to the great trade centres and seaports. Rice is the chief crop, but so

much is consumed that only a little is left for export. The export rice is sold in Borneo. Most of it is grown on the low coast plains, and these are watered by a net-work of canals.

Coffee is the crop that has made Java famous, and Java coffee is regarded the best produced. A few years ago it was the custom to sort the coffee with great care and then to store it several years in order to improve the flavor. The coffee thus seasoned was known as "old government" coffee. Much of the crop is now grown by private owners and is known as "private plantations" coffee.

Sugar has become the foremost export crop. Most of it goes to Europe; a small part of it is sent to the refineries of the United States. The great sugar plantations are likewise on the lowlands. Most of the plantations are owned by wealthy Hollanders, or by Dutch companies. The cane grows taller than that of the Cuban plantations; usually it is twice the height of the native laborers and grows so thickly as to make the field like a jungle. It requires a great sum of money to carry on a sugar plantation, for thousands of dollars must be spent in preparing the land.

But when one sees the great mills with their ponderous machinery, the thousands of native workmen, and the train loads of sugar which seem to be swallowed by the great steamships, one cannot help thinking that the sugar-planters make a lot of money in their business. Their homes, many of them, are beautiful palaces—as costly as can be found anywhere in Europe.

Indigo is another famous product of Java. The indigo plant would look like a rank bunch of weeds were it not planted in rows. The leaves, which contain the coloring matter, are picked two or three times a year and soaked in water. When they begin to rot, the coloring matter leaves the plant and mixes with the water, from which it is after-

ward separated by boiling. The coloring matter itself is called indigo; it is a beautiful blue used for dyeing yarns and cloth. The blue cotton cloth so much worn by the

Coffee-drying in Java

Dutch peasants is colored with indigo, and both the cloth and the dye find a market in pretty nearly every country in the world.

Years ago an enterprising Dutch botanist brought to Java some cinchona trees from South America. The experiment was successful and so many trees were afterward planted that Java now furnishes about half the world's supply of quinine, which is extracted from the bark of the tree.

Tobacco is extensively grown in Java, but one does not hear much about it, because a great deal of it is sold as "Sumatra" leaf. Tea-growing has become a great indus-

try in Java and the tea in quality is as fine as that grown in China. Women and girls are the pickers. They work with head and arms bare, each wearing a loose gown resembling a Japanese kimona without sleeves. As fast as they are picked the leaves are piled on squares of white cloth. When the cloth contains enough to make a bundle of good size the picker carries it on her head to the factory, where the leaves are first wilted, rolled into compact form and then dried on great stone floors that are shielded from the sun. The hundreds of pickers with their brightly colored gowns and white bundles, form a wonderful kaleidoscope picture.

In recent years petroleum, long known to the natives, has added much to the wealth of Java. The thrifty Hollander studied well-drilling in Pennsylvania and California; then he put his training to work on the Javanese oil-fields. As a result Java is beginning to supply not only the East Indies, but also Japan with coal-oil.

Years ago travellers used to tell marvellous stories about a certain poison valley of Java in the centre of which stood an upas-tree. The tree itself was famed for the deadly effects of its poisonous exhalations, which killed man, beast, or bird that came near it. These stories proved to be mere fabrications. They grew out of the fact that near by was a valley from which arose at times carbonic-acid gas in sufficient quantity to kill small animals running over certain low places. But the upas played no part, though the juice of the tree is poisonous.

Batavia is the capital of the Dutch East Indies. It is on low, flat land, half a dozen miles from the artificial harbor which has not long been finished; for the old port had but little protection from stormy seas and high winds. The swampy land on which the city is built has been drained by canals. Excepting the business streets, the city is almost

hidden by the gardens with their profusion of plants. It is the Amsterdam of the Old World; and one will find as good wares in Batavia as in Holland. During the eruption of Krakatoa, Batavia was buried deep in dust and ragged cinders of lava. More than twenty thousand dead were under the heaps of ash.

Surabaya is larger than Batavia and has a population of more than one hundred and fifty thousand. But Surabaya has not much trade with Europe; its commerce is mainly with the ports of Asia. The harbor is good and it has become the chief naval station of the Dutch East Indies.

The Dutch authorities do not encourage visitors to Java. All visitors must have passports or permits; and if one goes to the interior, officials question him at every turn and demand his permit at every district.

CHAPTER XXXIII

THE DUTCH EAST INDIES—SUMATRA AND CELEBES

Two lofty mountain ranges with a deep valley between them lie at the eastern side of the Indian Ocean. The Malay Peninsula is one range; the island of Sumatra is the other. The floor of the valley between them is covered by the sea and forms the Strait of Malacca.

As islands go, Sumatra is of goodly size—larger than New York, Pennsylvania, and the New England States together. From end to end its length is about the distance between Boston and Chicago. Greenland, Borneo, New Guinea, and Madagascar are each larger. The equator crosses Sumatra at its central part.

Sumatra is also a possession of the Dutch East Indies,

but it is not very important as compared with Java. Although it is three times as large as Java, it has scarcely one-tenth the population. There is a pretty good reason for this. In the first place, the mountainous region is very rugged and much of it is covered with jungle; therefore, it is neither habitable nor productive for mankind. In the second place, the broad plain on the east side of the island is not well adapted to cultivation; it is cut by deep river valleys in the higher parts, swampy in the middle part, and covered with water next the coast during a part of the year.

Rather singularly the lakes—and there are many—are not in the low, swampy lands; most of them are high in the mountains. What is still more singular, these lakes are the craters of inactive volcanoes. But Sumatra, like Java, has many active volcanoes. One of these, Dempo, is almost constantly active. Every now and then it discharges great quantities of sulphur gases; these are caught by the rain and, falling on the cultivated lands, kill pretty nearly everything touched.

In the jungles nature has been very lavish with life. The forests contain more than four hundred kinds of trees—among them teak, ebony, camphor, and even good pine. Sumatra is also the home of several trees and plants from which gutta-percha is obtained. Railroads to connect the forest belts to the coast are the one thing needed to make Sumatra a lumber-producing country.

For some reason or other many of the wild animals that crossed the shallow water between the Malay Peninsula and Sumatra did not cross the Sunda Strait to Java. There are many more kinds of animals in Sumatra than in Java; indeed, nearly all the larger species of wild animals of southern Asia are found in Sumatra, and only a few are in Java. There are many elephants in the uplands; the rhinoceros lives in the lowlands; the tiger lives in the jungle, as in

India. The flying "fox" is one of the curiosities of Sumatra. So much for a name, however, for the animal is not a fox but a very large bat. Its wings are membranes that connect the limbs corresponding to one's fingers. Like other bats, it hangs from the limb of a tree, head down, in

Natives in the jungle, Sumatra

the daytime, and goes to business at night. Its body is not much larger than that of a hare, but when in flight it is four or five feet from tip to tip.

The flying "cat" is likewise a misnamed animal that bears no relationship to pussy, but is a kind of lemur. The wild dog, however, is very much dog and nuisance at the same time—as much of a nuisance as the coyote of the western United States, and far more numerous. The "coffee" rat is likewise a great nuisance wherever found; unfortunately it is found almost everywhere. Monkeys are also numerous.

The natives of Sumatra, like those of Java, are Malays.

Unlike them, however, they are difficult to govern; some of the interior tribes are fierce and warlike. Near the coast, and in places controlled by the Dutch, the native ruler is subject to an "elder brother" or Dutch commissioner. Most of the tribes of the interior are Muhammadans; they believe that they will be blessed if they are killed in war, and, therefore, they take every opportunity to make war. The natives of Acheen, a province in the northwestern part of the island, have always given the Dutch a great deal of trouble, and they are not fully conquered, even after a hundred years of warfare.

One of the interior tribes, it is thought, came from India several hundred years ago, for their religion and customs are much the same as those of the Hindus. Although they are surrounded by savage tribes, and far removed from the civilization, both of India and Europe, they have reached a remarkable condition of civilization of their own. They are excellent farmers and stockmen; they also make firearms, cloth, and jewelry which they sell to the Malay peoples about them.

Throughout the island the houses are much like those of Malay peoples elsewhere, with timber frames and thatched roofs. As in the other islands, they are set on posts wherever floods are likely to occur. The larger timbers of many houses are beautifully carved, although many of the designs are grotesque and even hideous. All the houses are clustered in villages. This is done partly for protection against man-eating tigers, and partly because the people are inclined to social life. The clubhouse is usually to be found in the villages. It is the town hall, bazaar, market, lounging place, and social club combined. Perhaps a wedding and a funeral may be going on there at the same time. Men gamble, and women gossip and chew betel-nut; the peddler likewise shows his bargain-counter wares at the club-house.

The great plantations of sugar, coffee, and tobacco are managed much the same as in Java. The rice-fields are cultivated usually by the Chinese, and they have much of the trade in the rice. Sumatra is famous for its tobacco. The plants grow larger and higher than those cultivated in the United States. The leaves are large and the best of them are used as "wrappers," or outer coverings for fine cigars. Sumatra leaf commands a high price, and a considerable amount of the best tobacco is shipped to Cuba and the United States.

The coffee crop is also of excellent quality. Some of it reaches the market as "Java" coffee; and, indeed, it is equal to the best coffee grown in Java. The beans are large, light in color, and of fine flavor. Carefully sorted Palembang coffee commands a high price.

Sumatra is famous for its pepper, and not far from one-half the world's product of pepper comes from this island. The plant producing pepper is not the pepper-tree so commonly grown for its beautiful foliage and bright red berries in California and Mexico; it is a vine or climbing bush. It is commonly planted near to a sapling, around which it twines; but in many plantations the plants are pruned and trimmed so that they grow unsupported. The pepper of commerce consists of the dried berries or fruit of the vine. It is the custom to pick the berries as they turn red. The berries shrivel and turn black as they dry. These, when ground, are the black pepper of commerce. When fully ripe the color of the berry turns to a pale yellow and the outer skin is easily removed. The "husked" berries are used for making the white pepper of commerce.

Sago is also an important product of Sumatra. It is the starchy pith of a kind of palm-tree—the sago-palm. The pith is dried, ground to a powder and washed in order to remove the stringy fibre. In the process of washing, the

starchy granules sink to the bottom, while the woody fibre floats off.

There are several large towns in Sumatra—Siboga, Padang, Benkulen, Telok Belong, and Palembang—but their

A jungle, scene in Sumatra

names are rarely seen in print or spoken. The reason is not hard to find; Singapore, just across the Strait of Malacca, is a free port, with a fine harbor. Vessels from every part of the world call at Singapore, and it is much more convenient to have the Sumatra products marketed there than to send them from Sumatra ports.

A few miles to the east of Sumatra are the islands of Banka and Billiton, famous for their tin mines. These mines produce about two-thirds the world's supply of tin. It is interesting to know that the silver-white metal, with

which so many of our kitchen utensils are coated, has travelled more than half-way around the world to be used, but this is probably the case.

Sunda Strait separates Sumatra from Java. In this narrow strait is situated the island of Krakatoa, remarkable for one of the most destructive volcanic eruptions that have ever occurred. The great eruption was preceded by low rumblings and slight explosions for three months before the volcano burst out in all its fury, on the night of August 26, 1883. The explosions were heard at a distance of many hundred miles and over an area equal to one-thirteenth of the earth's surface. The entire southern part of the island was blown away and the earth was shaken for thousands of miles, the shock being recorded as far as South America.

The upheaval caused a tidal wave one hundred and twenty feet high which, with the lava clots and ash ejected, destroyed all of the towns and plantations bordering on both sides of the straits. In this disaster more than forty thousand persons perished and every vestige of animal and vegetable life in the surrounding region disappeared. The only person left to look out upon the scene of destruction was the keeper of the light-house, a structure one hundred and thirty feet high, whose light the gigantic waves merely succeeded in extinguishing.

A cubic mile of material is said to have been thrown out in the form of lapilli and dust by the successive explosions. The dust, estimated to have reached the height of several miles, was disseminated by the upper currents of air and caused the brilliant sunsets seen for months in nearly every part of the civilized world.

Celebes is the most curiously shaped island in the world. It has a central body from which project four large arms, making it look like a huge star-fish. These radiating peninsulas are mountain ranges, here and there peaked with

volcano cinder cones. There are no low-lying marshes; the position and high surface render this one of the healthiest islands in the Malay Archipelago.

The Dutch have had settlements here for more than two centuries; and their wise and just treatment of the natives has made the island famous for peace and prosperity. Except a few tribes of the interior, all the islanders are at least partly civilized. The natives who live in the coast regions are intelligent and industrious. Paganism and corrupted Muhammadanism are the prevailing religions, but Christianity has secured a firm hold in a few places. A written language and literature have prevailed for centuries.

All able-bodied men are compelled to work and each year to give a few days' labor to keep the excellent roads in good repair; but they reap the reward of their industry and are happy and contented.

The best coffee land in the East Indies is to be found on this island. The most favorable soil for coffee is the rich, black volcanic ash that covers the mountain slopes in many parts of north Celebes.

The Menado coffee is said to be the finest the world produces.

The coffee-trees are allowed to grow to the height of six feet, when the tops are cut off, so as to strengthen the growth of the lateral branches which bear the fruit.

Besides a fungus disease, coffee has many other enemies. Both rats and mice are fond of the juicy stalks of the berries when they are nearly ripe, and they nibble at them until the berries fall. The long-haired black rat is the greatest of these pests. Cats are kept on each plantation to prey upon the animal pests; but, unfortunately, the natives are very fond of cats—not as pets, but as articles of food. This feline appetite on the part of the workmen causes the owner to keep a vigilant watch over his cat family, and to severely

punish any offender. Perhaps in time they will learn to employ the python as a rat-catcher, for the python is not surpassed for this purpose.

The forest trees are much like those of the adjacent islands. There are no very large animals, those peculiar to Celebes being the tailless baboon and the "pig-deer," which has tusks and curving horns.

Parts of the interior of Celebes still remain unexplored and are said to be inhabited by cannibals and head-hunters.

Macassar is the capital and chief city. It is situated in the southern part of the southwestern peninsula, and in commerce ranks next to the largest cities of Java. Its trade totals upward of three million dollars annually.

The principal exports of the island are coffee, rice, nutmegs, cloves, dammer, copal, rattan, copra, tobacco, trepang, and tortoise-shell; coffee greatly outranking all the other products.

CHAPTER XXXIV

BORNEO AND PAPUA

HOT, damp, and swampy along the coast lowlands; rugged and fairly pleasant in the high plateau lands—that is Borneo, an island as large as the State of Texas. Borneo has a great future, however, when a race of civilized people can be found who can inhabit it, for it is even more unhealthful than Sumatra.

But the wealth is there—diamonds that are rather poor in color, gold, copper, iron, coal, and petroleum. That is a good list, and it remains only to find a people who can live there and make the great wealth of the island available to the world. Perhaps it may be the Japanese—less likely the Chinese, for they are content to trade with the natives.

Possibly it may be the Filipinos—for some of the Filipinos, especially the Moros, are the descendants of Borneo peoples.

Safe it is to say that the native tribes will not accomplish this result, for they are among the most debased and disgusting savages on the face of the earth. Many of these tribes are Malays governed by chiefs, or dattoes. Some of the tribes near the coast carry on a crude sort of farming, which is encouraged by the Chinese merchants who buy their produce. Some of the interior tribes just live, being both lazy and vicious. For food, there is an abundance of bananas and meat. As to the meat, it makes little or no difference about the kind; any animal whose flesh has become putrid is relished.

The most interesting natives of Borneo, however, are the Dyaks, the people from whom the Moros of the Philippine Islands are descended. They are perhaps the most intelligent, but certainly the most troublesome peoples. They are best known as the "head-hunters" of Borneo. Among themselves, the one who has killed the greatest number of people is the greatest man of the tribe, and the heads of his victims are the testimony to his greatness. So the head-hunters kill just for the pleasure of killing, and the heads of their victims are kept as trophies. Not all Dyak tribes are head-hunters, however.

When they are not off on head-hunting expeditions, the Dyaks are very industrious farmers. They are fond of ornaments. The men of some of the tribes wear richly embroidered jackets; the women may wear waists made of fine rattan strung with metal beads and ornaments. They may even wear crowns of burnished metal; at all events, they are certain to wear earrings of astonishing size—perhaps three or four inches across and made of solid brass. To hold these pieces of native jewelry the lobes of the ears,

after they have been pierced, are stretched until they form loops two inches or more in length.

The men also are fond of earrings and similar ornaments, but a real Dyak swell does not consider himself properly in style until his front teeth are filed away so that they are notched and shut together like the teeth of a steel trap. Moreover, he cannot hope to obtain a wife unless he has at least one head as a trophy.

In hunting, the Dyak often makes use of the blow-gun. This weapon, for short distances, is about as sure and true as a rifle. It is a wooden tube four or five feet in length, the bore of which is made very straight and smooth. The arrow, or dart, fits the bore of the tube. To make sure of the game the tip of the dart is dipped in a most deadly poison; so that, if it merely breaks the skin of the animal at which it is shot, it makes a wound that is quickly fatal.

Unlike most of the natives of the tropical Indies, instead of living in villages, the Dyaks frequently live in communal houses. Sometimes twenty or more families live in the same house, which is not unlike the communal houses of the American Indian, except that it is surrounded by a broad veranda.

Hunting honey in the forests is one of the native sports. The forests of certain parts of Borneo seem to be alive with wild bees. As a result, honey and wax are very abundant. The honey-bear gets a good share of the wild honey, for his shaggy hide is proof against the stings of the bees. The Dyak hunter has no shaggy coating to protect him; so he goes about robbing the bees in a more scientific manner.

The bees seem to prefer the mengalis tree, which has so many angles and hollow places about its trunk that to build the comb is an easy matter. Not infrequently there may be fifty or more swarms in a single tree. When a bee-tree is to be robbed, great piles of a certain plant or weed are

collected and put in such a position that the smoke will be carried against the nesting-places of the swarms. The piles are then fired. The smoke neither kills the bees nor does it drive them off; it merely stupefies them. When the humming of the bees is hushed, comb and honey are easily removed. A considerable part of the wax is exported, but thousands of tons are wasted.

Hunting in the forests of Borneo has its unpleasant features, for the leeches are almost as numerous as the leaves of the trees. They are big, fat, ugly-looking slugs, but they can stretch their bodies into a small, thin form. When waiting for a victim they lengthen and sway their thread-like bodies to and fro, ready to launch out at the first opportunity. So gently do they commence their work that the pricking sensation is felt only when they are gorged with blood and begin to loosen their hold.

The gathering of edible birds' nests, built by a kind of swallow, is quite an industry, and is confined to the rocky-cliff sections of certain parts of the coast where cover abounds. This species of swallow is smaller than the common swallow and builds its nest either in the dark limestone caverns or in the crevices and nooks of the overhanging cliffs. The chief material used in constructing the nest is a glutinous saliva produced by the bird itself. The Chinese are very fond of the nests, and Chinese merchants buy most of them.

The roofs of some of the caves frequented by these swallows are several hundred feet above their floors, and to reach the nests, scattered over the curved roofs and sides, it is necessary to construct ladders and stages. These are made out of rattan and bamboo and are fastened by pegs driven into the limestone walls. Crawling up on these slender supports with a candle and forked bamboo pole, the native proceeds to detach the nests, which he passes to a companion

below. When the nests are built in caves and crevices, near the top of cliffs, a swinging ladder is dropped from above.

There are two kinds of nests, the clear yellowish-white ones, and the dark ones. The former bring a price as high as twelve dollars per pound; the latter only one-tenth as much. The best nests are found in the darkest caves.

Bird-nest gathering is a perilous calling, and serious accidents are not infrequent. The nests are gathered two or three times a year.

The northern part of Borneo is British territory, and the British also control the States of Sarawak and Brunei; the rest of the island is a part of the Dutch East Indies. The British are more interested in the minerals and jungle produce, such as gutta-percha, rattan, rubber, and birds' nests, than in the cultivation of plantations. The Dutch, on the other hand, are trying to establish the great plantations there that have made Java famous. Already these are producing great quantities of sago, tobacco, and sugar.

There are no large cities and only a few ports with good harbors, but German steamships make the rounds of the ports and carry the produce to Singapore, the clearing-house of the East Indies.

Scarcely one hundred and fifty miles north of Australia lies Papua, or New Guinea. Next to Greenland it is the largest island in the world, and in many ways it is the world's wonderland. It was one of the first large bodies of land discovered after the discovery of America, and one of the last to be settled by Europeans. Most likely dry land at one time connected Australia and New Guinea, for the animal and plant life of the two are much the same. Even the Great Barrier Reef that skirts the east coast of Australia extends part-way around New Guinea.

Of all the islands southeast of Asia, New Guinea is the most interesting. It is rich beyond measure with things

useful and beautiful. Sugar-cane grows wild from sea to mountain; wild oranges, lemons, and limes can be had for the picking; and land adapted for growing rice, coffee, tobacco, rubber, cocoa-nuts, and cinchona is plentiful. There are mountain summits clad in everlasting snow, healthful plateaus abounding in delightful scenery, and dank coast plains in which lurks the deadly jungle fever.

Dense forests cover most of the island, but the forest trees of the East Indies are not to be found except here and there in the northwest neck of the island. The famous eucalyptus abounds in the lowland regions; so also does the nipa-palm. Pines, much like the kauri pine of New Zealand, grow in the high plateaus. Most singular of all, in the high mountain regions one may find the alpine plants of Europe, New Zealand, the Antarctic islands, and the Andine heights of South America. Still another strange feature is to be found: while the forest trees are Australian kinds, the plants that make the forests a thicket are the rattans and other jungle plants of India!

New Guinea is noted for birds of beautiful plumage, especially birds of paradise, of which there are many kinds. Among the insects is one commonly known as the "praying" mantis. It is related to the grasshopper and is found also in many other parts of the world. In New Guinea the praying mantis is three or four inches long and at first sight seems to be nothing but a broken twig. In various parts of the world it is known as "preacher," "nun," "soothsayer," and "saint." It has received its name from the fact that it rests in a sort of kneeling position, holding its forelegs in a devotional attitude.

Its character, however, is anything but saintly; it is a most vicious wretch that may well be called the tiger of the insect world. The devotional attitude is the position in which it can best seize its insect prey; for when an unsus-

pecting insect lights on what seems to be a green twig, snap! —those blade-like forelegs armed with sharp spikes come together like scissors, and the unlucky victim is cut to pieces in an instant.

John Chinaman has discovered a use for the praying mantis—a very practical use, too. John and his near-by friends capture a lot of the insects, carry them to a convenient bungalow, turn them loose in a cockpit, and bet on the survivor. When the insects are turned loose there is business on hand, for they go to work at once, cutting one another to pieces by the most approved methods of surgical amputation. The owner of the survivor wins.

The native Papuans much resemble the bushrangers of Australia; they are Negritos, with black skins and woolly hair. There are a few tribes of natives that much resemble the peoples of Samoa and Hawaii; there are also other tribes that resemble the Malays of southeastern Asia.

The Papuan tribes of the coast are about as degraded as the bushrangers of Australia. Some of the tribes are cannibals who have a fondness for sailors that have been wrecked on the shores of New Guinea. They are neither better nor worse than most of the other tribes of islanders. Like other islanders, too, they are tractable and easily governed by the Europeans who treat them decently. Not very much is known about the tribes in the interior, except that some of them have neither houses nor clothing. They live in the trees, and wear no clothing. They are hardly better off than the troops of monkeys, but unlike them eat raw flesh instead of fruit and nuts.

Missionaries have established schools along the coast settlements, and the native children trained in these schools make amazing progress. They learn to read and write quickly, are neat in dress, and polite in manners. Many of the boys who attend the mission schools are trained to

skilled labor on the plantations; some go to the interior as missionary teachers.

A few of the Papuan tribes have reached a condition of barbarism much like that of the Iroquois Indians in New York when the white men found them. They live in houses, some of them four or five hundred feet in length. Perhaps thirty or forty families may occupy a single house. The houses are divided into apartments, each family living separately.

In some of the tribes the men live in a communal house by themselves. The women live in small huts, two or three together. They cook the food, which they carry to the communal house; they also do all the work required in cultivating the gardens of yams, bananas, and vegetables. War, hunting, and fishing are the only pursuits of the men.

Three nations, Holland, Great Britain, and Germany, have divided New Guinea among them. The Dutch have the eastern half of the island. The British and Germans possess each about one-quarter, British New Guinea being situated opposite to Queensland, Australia. The British own the Solomon Islands to the eastward of New Guinea, also.

The Dutch are laying out plantations and teaching the natives to work them in the same way that they are managed in Java. The British are busy exploring the interior, looking especially to the rich mines in their possession. They have also established a considerable trade in copra, sago, pearl shell, and cocoa-fibre mats. They are planting rubber-trees, for there is no better land in the world for rubber. They have one great advantage, namely, the Fly River, which is navigable six hundred miles from its mouth, and opens a trading route far into the interior. Port Moresby is the trade centre of British New Guinea.

The Germans make their share of the island pay expenses

by taxing and licensing the traders who go there to do business, and they manage to get a considerable profit out of it. When they find that a trading company is making too much money they buy the company out and carry on the business themselves; and this is profitable, too.

Although less is known about New Guinea than almost any other part of the earth, enough is known to make it certain that it is one of the most desirable bodies of land in the world.